INTERNATIONAL SPACE ACTIVITIES, 1979

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

FIRST SESSION

SEPTEMBER 5 AND 6, 1979

[No. 50]

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WITNESSES

INTERNATIONAL SPACE ACTIVITIES, 1979

WEDNESDAY, SEPTEMBER 5, 1979

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 2:10 p.m., in room 2325, Rayburn House Office Building, Hon. Don Fuqua, chairman, presiding.

Mr. FUQUA. For the next two days, the subcommittee will review the opportunities and issues associated with expanding worldwide space activities and review the conclusions and recommendations of the Panel on International Space Activities which was convened by the subcommittee in June 1978.

The session this afternoon will address the international utilization and management of space systems. The Space Shuttle and Spacelab will provide substantial opportunities for international programs, and every effort must be made to insure efficient and economical operation of these new systems.

In addition, planning for future and more advanced space systems must also consider the needs of worldwide users, as well as the needs of the United States.

To address this important area of international utilization and management of space systems, the subcommittee has invited three distinguished individuals.

Mr. Andrew J. Stofan is NASA's Deputy Associate Administrator for Space Sciences. His office is responsible for defining and implementing the space science missions, as well as the initial utilization of Spacelab.

Dr. Burton I. Edelson is vice president for Systems Technology Services, Comsat Corp., and was a member of the 1978 Panel on International Space Activities.

Also, Dr. Delbert D. Smith is an attorney at law and has made substantial contributions to understanding the institutional and legal aspects of international space activities. Dr. Smith also served on last year's panel.

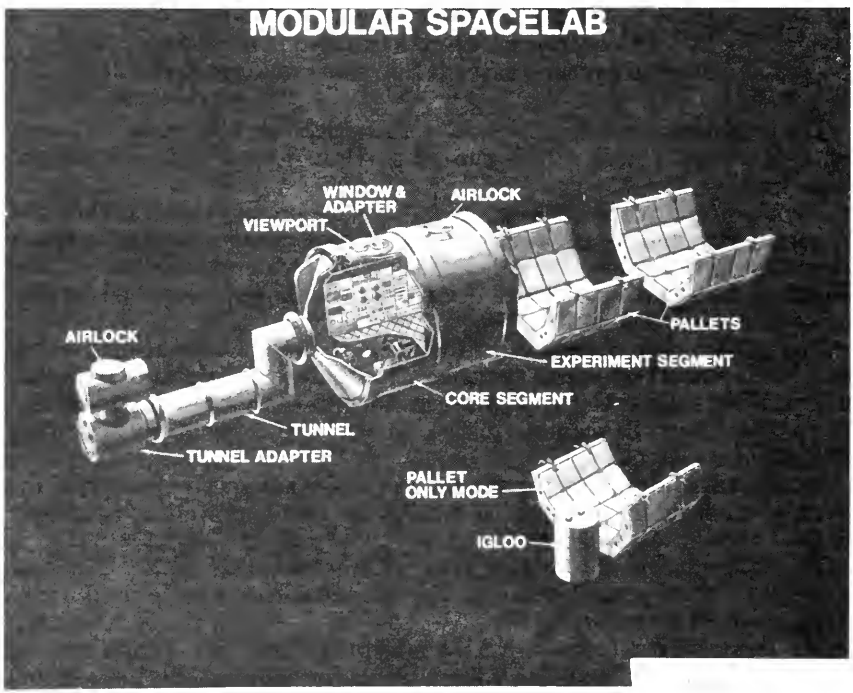
Mr. Stofan, will you please proceed.

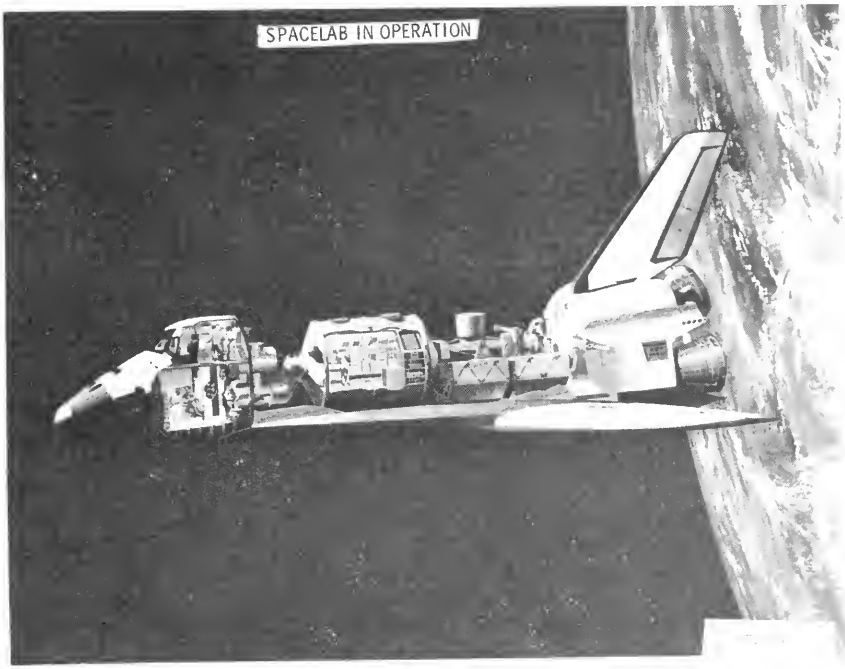
STATEMENT OF ANDREW J. STOFAN, NASA

Mr. STOFAN. Thank you, Mr. Chairman, for this opportunity to present to you some of our current and projected activities in the international space programs with emphasis on the utilization of new space systems. As you are well aware, NASA has a very active interna-

tional cooperative program with significant foreign participation in several major flight programs. With the advent of the Shuttle era, this cooperation will be expanded even further.

In this statement today, I will review the international aspects of the utilization of both Shuttle/Spacelab and newly evolving low Earth orbit space platforms. In particular, I will be covering current and projected international Spacelab activities and will be introducing to you the results of recent conceptual studies of science and applications space platforms.

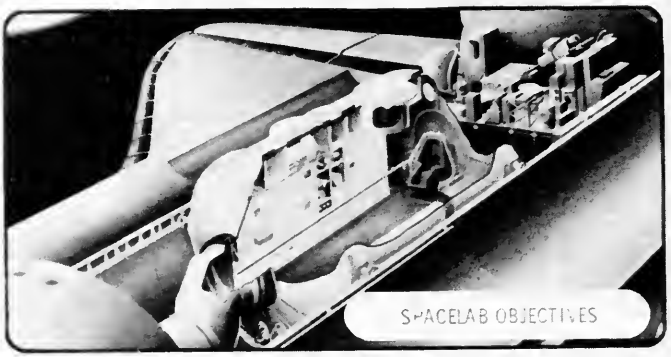




The Spacelab program is a cooperative effort between NASA and the European Space Agency (ESA). ESA is designing and developing the flight hardware, illustrated in figure 1, and NASA has the overall responsibility for launch and inflight operations. The Spacelab, shown in operation in figure 2, is composed of pressurized modules and pallets which are exposed to the space environment. Shown on the left are the crew and crew quarters. They can go into the core segment through a flexible tunnel where a shirt-sleeve environment is provided for the space activities and experimentation. Shown beyond the core segment are two pallets where Earth-viewing or space viewing instruments may be mounted.

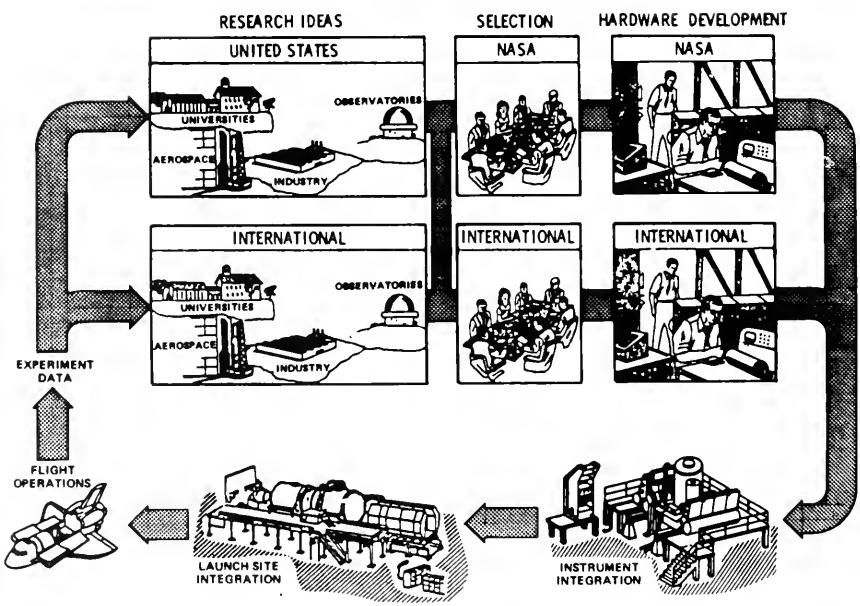
The Orbiter can stay in orbit for up to 7 days with a crew of four to seven people on board. The stay time can be extended slightly by off-loading some of the experiments and providing more resources on the Orbiter.

With the introduction of the Spacelab into the space transportation system (STS) as a payload carrier, a new era of easy access to space for the experiments will have begun. The entire international community of investigators may take advantage of the Spacelab objectives, summarized in figure 3, to participate in the space program. International utilization of Spacelab has been a part of the Spacelab program from the outset. In fact, the very first Spacelab mission includes instruments and investigations from many nations around the world. The process and procedures by which an experimenter may participate in the international utilization of Spacelab are flexible and are shown pictorally in figure 4.



- ACCOMMODATE SINGLE OR MULTIPLE USERS SHARING FACILITIES ON A GIVEN FLIGHT
- ALLOW USE OF GROUND LABORATORY EQUIPMENT WITH MINIMUM MODIFICATION
- PROVIDE USER INVOLVEMENT THROUGHOUT MISSION

Figure



Figure

NASA solicits experiments through an announcement of opportunity (AO) process and proposal that may come from universities or industry. After a peer review of the proposals, some are selected and normally funded for development by NASA. When they are developed, they are integrated into payload and Spacelab, flown, and the data is returned.

In a similar manner, the international community may respond directly to the AO and have their experiments selected by peer review; developed, and flown as cooperative programs.

Also, in cases where the international community wants a dedicated Spacelab mission, the instruments are selected, integrated, launched, and operated as a reimbursable type mission.

NASA makes a distinction between cooperative and reimbursable uses of the Shuttle/Spacelab in international aspects of utilization. Earlier this year, Mr. Frutkin outlined those concepts to the committee. Cooperative launchings are provided free of charge for foreign spacecraft or instruments after we have determined that they will contribute to NASA science and application program objectives. Foreign spacecraft or instruments not meeting these criteria or which have a commercial or operational objectives may be launched by NASA under reimbursable arrangements in which the NASA costs are paid by the foreign requester. At present there are 27 cooperative investigations on early Shuttle/Spacelab missions. We are exploring possibilities for other missions with several countries.

Earlier this summer, we met with Japanese space officials to consider potential cooperation in several areas of interest to both countries. The main areas discussed included ocean dynamics and resources studies, geodynamic measurements for tectonic plate motion, and participation in astrophysics and plasma physics missions. One of the first active experiments in space made possible by the Spacelab is an electron and ion accelerator provided by the University of Tokyo, Japan. This instrument, SEPAC, space experiments with particle accelerators, will investigate the process through which auroras are formed; radio emissions are produced; and some types of electric fields are established. Continued participation in a similar manner with Japan is anticipated with the possibility of extending the degree of partcipation beyond the sharing of data or building specific instruments to the operation of the payloads in orbit.

In another venture, the Soviets have a series of unmanned missions with biomedical and biological experiments on which we have not only shared the data, but also flown U.S. experiments. These have been flown in 1977, 1979, and will fly again in 1981. Reciprocally, we are planning to include Soviet experiments in our Life Sciences dedicated Spacelab missions.

To date, three Spacelab missions and several partial missions have been approved for flight on the STS. The international involvement in three of these payloads is summarized in figure 5 with the payloads for the Spacelab 1 mission involving by far the largest number of foreign experimenters. The broad geographical distribution of all of the principal investigators in this first Spacelab mission is illustrated in figure 6. This chart shows the countries from which the principle investigators come and the number of investigations from each country. As can be seen, Spacelab 1 is truly an international mission.

INTERNATIONAL UTILIZATION OF SPACELAB IN APPROVED MISSIONS

SPACELAB 1 -- MULTI-DISCIPLINE MISSION

-- PARTICIPATING NATIONS

NON-ESA

- **UNITED STATES**
- **JAPAN**
- **INDIA**

ESA

- **AUSTRIA**
- **BELGIUM**
- **DENMARK**
- **FRANCE**
- **GERMANY**
- **ITALY**
- **NETHERLANDS**
- **SCOTLAND**
- **SPAIN**
- **SWEDEN**
- **SWITZERLAND**
- **UNITED KINGDOM**

SPACELAB 2 -- SPACE VIEWING EMPHASIS

-- PARTICIPATING NATIONS

- **UNITED STATES**
- **UNITED KINGDOM**

Figure 5

GEOGRAPHICAL DISTRIBUTION OF PRINCIPAL INVESTIGATORS FOR SPACELAB 1

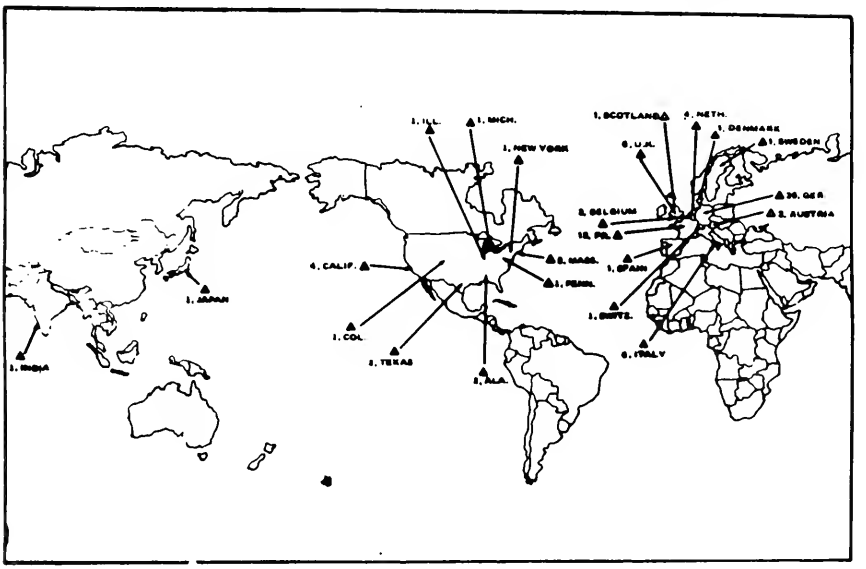


FIGURE 6

Another aspect of the international involvement, even on the early flights, is through participation in the operations of experiments on orbit. This is possible through the payload specialist program whereby an individual is seletced to fly with the mission to operate certain assigned payload elements. In this capacity, the payload specialist serves as an extension of the ground-based investigators.

Experimenters for a specific payload establish the Payload Specialist selection criteria, and the nation supporting the mission will be responsible for the final approval of the selection of the payload specialist.

Figure 7

For Spacelab 1, payload specialists were selected by the body of international investigators and submitted to NASA for approval. Payload specialists selected for Spacelab 1, pictured in figure 7, are from Germany, Switzerland, and the Netherlands, as well as the United States. One from the United States and one European will be selected for flight on the mission while the remaining three will provide support from the ground.

Flight on Spacelab 1 is only the first step in these science and applications investigations. Additional flights are desired to realize the full potential of some experiments. In addition to the presently planned missions in the early years of Spacelab missions, NASA is anticipating an increase in flights to approximately six per year by the mid-1980's. In the space applications discipline areas, such as materials processing and Earth sciences, it is expected that one or two missions each year would involve the use of the pressurized module while others would only utilize the pallet configurations. Similarly, in the physics and astronomy disciplines about the same types of missions will evolve. The life sciences discipline will utilize a dedicated module mission about every 18 months.

The international community is planning for future use of the Spacelab experiment mode. For example, in addition to potential reflights of selected investigations on the missions now in development, both the Federal Republic of Germany and Japan are studying Spacelab missions which they would sponsor. An activity is underway to define the German mission for a potential flight in the 1983–84 time period. The Spacelab configuration for this mission is similar to that

for Spacelab 1 and will include similar science and applications discipline activities. The Japanese Spacelab planning activities have identified partial payloads initially growing into a full mission in the late 1980's emphasizing material science and life science disciplines.

At this time, let me address a concern which was raised in the panel discussions and testimony last year, namely, the cost of Shuttle/Spacelab utilization. The Spacelab mode was originally envisioned to be an economical, walk-on laboratory type operation similar to ground-based facilities. With the experience gained to date through preparation for Spacelab 1 and 2, we have come to realize that our present approach of having a totally integrated system may not be the way to proceed for the future. If the Spacelab concept is to be truly viable, we must evolve the system into a simplified, autonomous, efficient space laboratory. We have initiated an in-depth study of our present plans and will identify and implement those areas where changes should be made.

The idea of a simple laboratory in space is attractive not only to the international science and applications user community, but also to potential industrial and commercial business. It will remain attractive only if the planned cost-effectiveness of this approach can be achieved and demonstrated.

As stated before, the space transportation system and the Spacelab will provide the user community with new capabilities to accomplish their missions in space. These highly attractive capabilities include large payload capacity and high power availability, ease of access for space experiments, and active manned interactions and operations. At present, these capabilities are available for mission duration of approximately 1 week, whereas many of the major space science and applications instruments and facilities, once developed, will derive considerable additional benefits from opportunities for extended duration in space.

During the past year, a joint ESA/NASA Imaginator Working Group has been coordinating studies undertaken by both ESA and NASA on Shuttle/Spacelab extension. The group will make recommendations concerning missions whose requirements might possibly further the Spacelab system development. A final report of the group will be submitted soon to the ESA Director General and the NASA Administrator.

The mission requirements are being examined in several discipline areas and the need for long duration is inherent for some investigations. For example, in the life science research areas, if understanding of the effects of gravity and its complex influence on biological mechanisms is to be obtained, long-term studies of the complex interactions of gravitational forces with living systems, both plants and animals, must be accomplished. Understanding the effects of the gravitational environment on these mechanisms will not only expand our understanding of fundamental biological processes, but may well have important applications in medicine and agriculture.

In a similar manner, the material processing discipline area could benefit from missions having long duration, high power, and very low gravity, to develop and demonstrate processes and techniques for enhancing production of materials and their desired characteristics. For example, containerless processing techniques for handling

molten reactive materials might eventually be exploited by particular commercial endeavors.

It is envisioned that the current Spacelab and space transportation system capabilities could be extended by systems that are presently under study. Mission durations of up to 20 days could be obtained by using a Shuttle-attached power extension package—illustrated in figure 8—which provides power up to 20 kilowatts. During launch the Orbiter carries the power extension package and remote manipulator system in a stowed condition. In orbit, they are deployed: the solar panels unfurl; and the system provides up to 20 kilowatts of power, providing longer mission times. Sixty days or longer in orbit can be achieved by docking with a free flying 25-kilowatt power module shown in figure 9. Illustrated are the solar arrays, heat rejection panel, and the power conditioning and attitude control module. After this system has been flown into space, a Shuttle/Spacelab mission would dock with it, with the power module providing the power for up to 60 days of operations. At the completion of the mission, the Shuttle will return to Earth, leaving the 25-kilowatt power module in orbit.

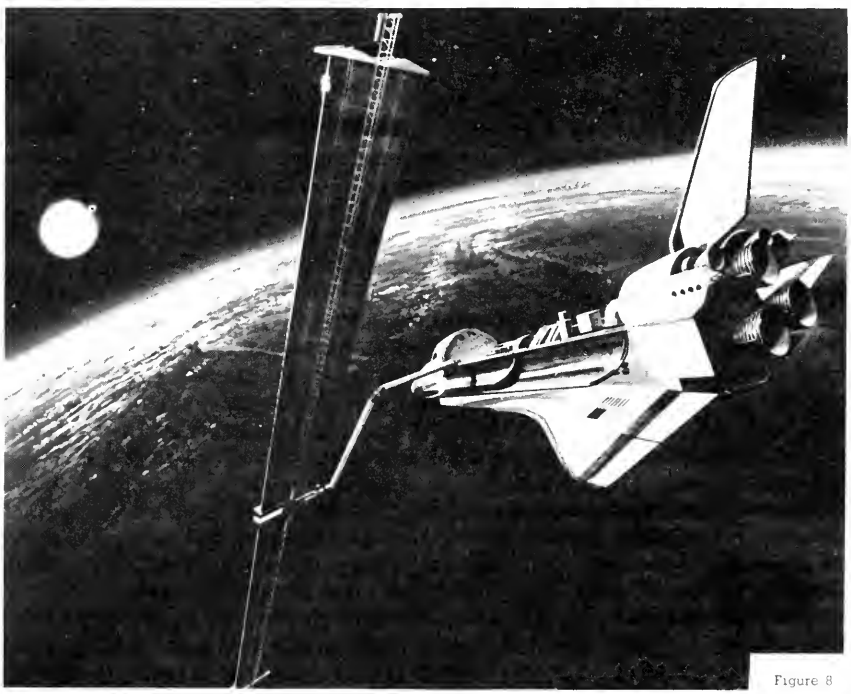


Figure 8

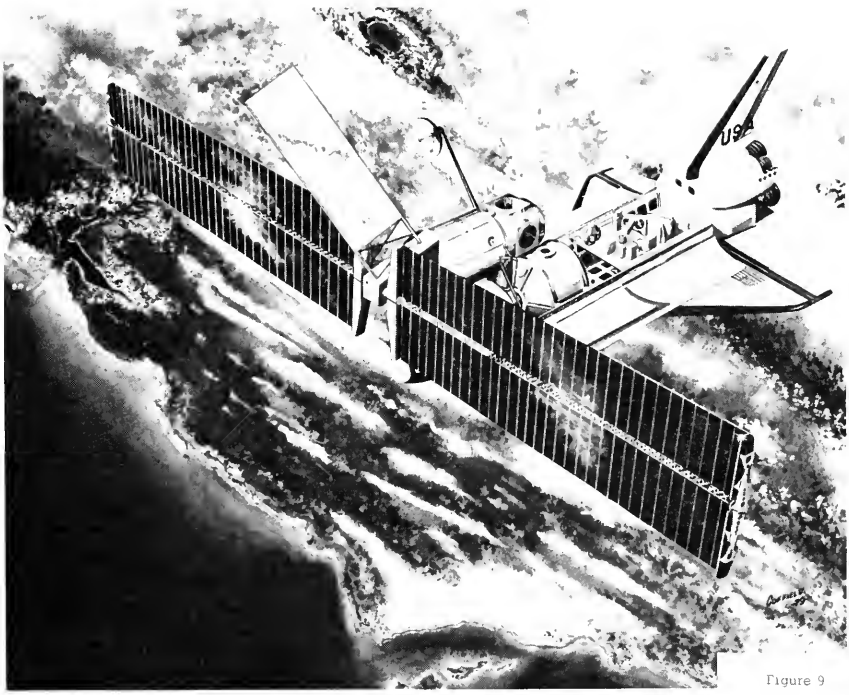


Figure 9

A means for accomplishing flight durations in excess of 60 days might involve the use of some form of orbiting space platform onto which Spacelab instruments, or other payloads, can be offloaded from the Orbiter cargo bay. Power, telemetry, and stabilization and other support services previously provided in the cargo bay by Shuttle/Spacelab would then be derived from the platform system.

One approach would be to provide the instruments with a common interface, mimicking the Spacelab interfaces which the experiments "see" while operating in the Shuttle sortie mode. The instruments or groups of instruments would then be able to remain in space for as long as required to achieve their scientific objectives. They would be serviced or even manually operated during occasional visits of the Shuttle to the platform. Upon completion of their programs, individual instruments would be returned to Earth by STS for possible refurbishment, reconfiguration, and reuse while the platform system remains on orbit as a base ready to accept new experiments.

During the past year, NASA sought to determine if a space platform approach would be an attractive concept to the science and applications user community. A number of scientific and technical groups have been asked to consider their projected needs and requirements as they might relate to such space platforms. NASA is now in the process of assembling the information received from these groups and is developing and assessing platform system concepts. While this informatioon is based on requirements specified by the U.S. scientific and technical community, our experience indicates that these requirements will be similar to those of the international community.

In accommodating these user requirements, NASA views such a platform capability as a natural extension of and complementary to the Spacelab mode of operations. These early platforms will provide the users with a long duration facility capable of delivering substantial amounts of power for experimental investigations. By offloading experiments, the Shuttle will be free to return to Earth for other mission assignments. The payloads will remain on-orbit, pursuing their scientific objectives in a disturbance-free environment, serviced and maintained through occasional visits by the Orbiter.

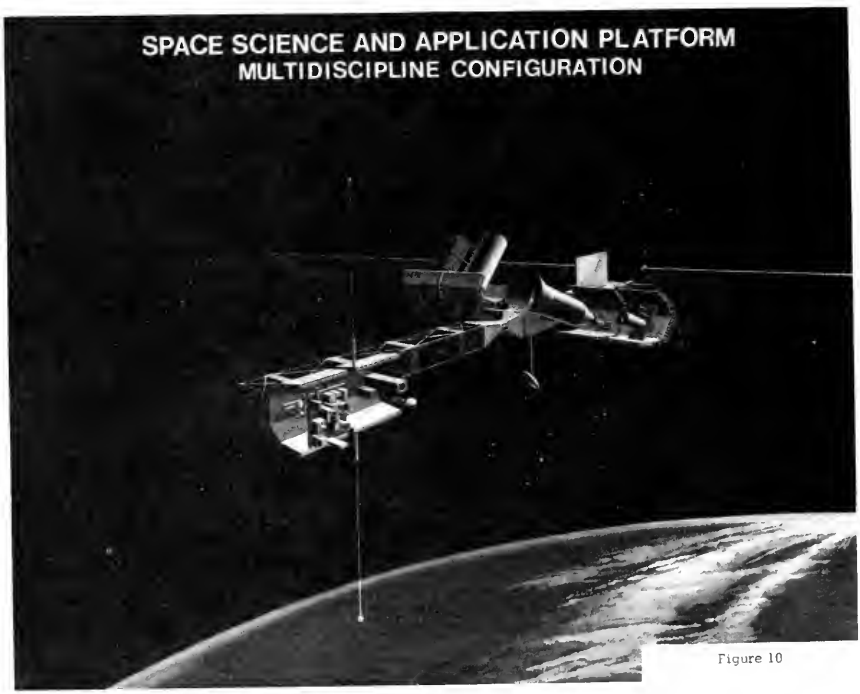


Figure 10

An early concept of a space platform is shown in figure 10. A power system with its solar panels provides the support services to simple structural members onto which playload carriers containing the experimental equipment are mounted. This multidiscipline configuration includes three structural "arms" which can independently rotate, providing the capability to view simultaneously in several different directions. Each playload carrier would be self-supporting except for power and communication links provided by the power system. Each carrier can be added or removed, active or dormant, without affecting the other carriers. The platform would be visited by the Shuttle, permitting replacement or servicing at periodic intervals. This operational autonomy and ease of access and return should be attractive to commercial ventures, as well as for science investigations depicted in this early concept.

A modification of this concept is shown in figure 11 where the platform is conceived to be dedicated to a single disciplinary area with a cluster of instruments for ionospheric, atmospheric and magnetospheric observations and measurements. Only one structural arm is required in this configuration which indicates the need for a modular

design approach. Also shown is another capability where the platform serves as a docking base for a maneuverable subsatellite used to make measurements in concert with the other payload elements.

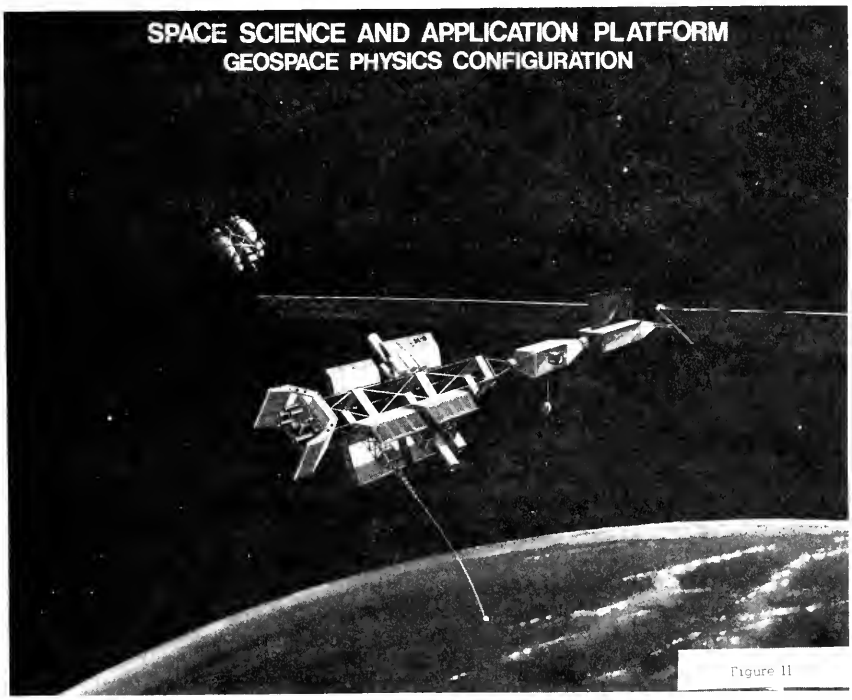


Figure 11

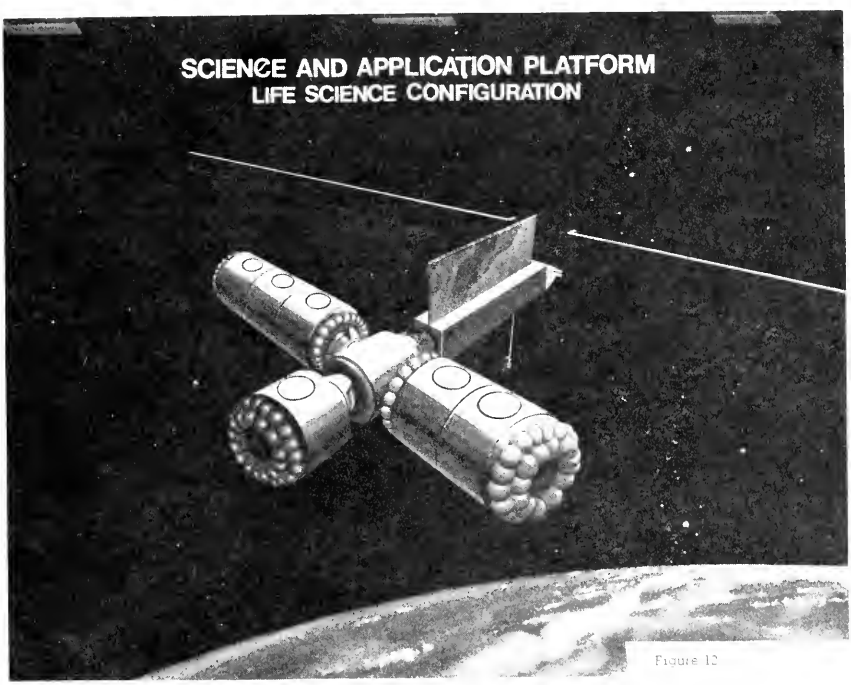


Figure 12

Looking still further into the future, one could project the need for a manned platform as depicted in figure 12. Here the power system supports pressurized structural elements in which people can live and work. For this Life Science research configuration, the larger two of the three modules are envisioned to be the laboratory and the living quarters with the third module being a service/logistics element. It would be envisioned that this manned platform could accommodate crew sizes as large as eight people, with crew rotation at regular intervals if needed.

Similar to the Spacelab 1 mission, we expect the payload specialists crew for the platform would be international in character with each nation participating in studies such as effects of long duration exposure to the space environment on cardiovascular deconditioning and bone mineral loss. While this concept is identified for the Life Sciences activities, an essentially similar system could support any activity requiring a pressurized volume, that is, material processing.

The Spacelab will, indeed, initiate a new era for space experimentation and, in conjunction with the Space Shuttle, could be an early version of a platform in space. Considerable international utilization of the Shuttle/Spacelab capability is now underway, and future activity is being planned. In their long-range planning, other nations see the transition from the demonstration phase to the operational and commercial application aspects of space exploitation. Within this framework, the trend toward greater flexibility, larger instruments and instrument groupings, higher power requirements and longer mission durations within nearly all disciplines becomes evident.

Thus, the new and exciting capabilities of the Shuttle/Spacelab and the potential development of both unmanned and manned space platforms offers new opportunities for continued international involvement in the exploration and use of space.

Thank you, Mr. Chairman.

Mr. FUQUA. Thank you very much. We thank you for your testimony.

If you do not have a time problem, could we hear the other two witnesses because I think many of the questions may interrelate to each of you.

Thank you very much.

Mr. STOFAN. OK.

[Answers to questions asked of NASA follow:]

QUESTION 1:

In June 1978, the House Science and Technology Committee held a panel on international space activities. The panel made certain recommendations regarding cost reductions for international space activities (recommendation #3 in the panel report).

Are there any other specific ways in which the cost of conducting space science activities might be decreased?

ANSWER:

The major concerns are still centered around the transportation costs and, in particular, how the Spacelab mode of space operations can be effectively utilized considering these costs. As stated during the panel sessions, these costs cause some reluctance in developing large Spacelab facilities which must have repeated flights to effectively utilize their capabilities. The additional resources (duration on orbit, more power to experiments) to be provided by the Power Extension Package and the Power Module will substantially help. Conceived as a possible extension of the Spacelab Program, the platform has the potential of significantly improving the overall cost-effectiveness of Spacelab-type operations.

In my testimony, I indicated that we have initiated a study of the integration concepts for Spacelab systems. We are continuing in our attempts to identify new areas where cost reduction can be achieved, ranging from the basic instrument costs to the payload carrier support costs and to the improvement of cargo packaging efficiency. As the Spacelab Program grows with new instruments and repeat flights, we will have to develop effective means to maintain and relaunch these systems without significant reintegration activities. Experience with the flight system will be the leading aid in identifying cost reduction techniques.

QUESTION 2:

Have any countries implied that they may rent pallets for dedicated space science experiments of their own, in the same way as they might rent an entire Space Shuttle flight for materials processing experiments?

Will the U.S. fly international experiments on pallets of its own?

ANSWER:

NASA has been having continued discussions with the European Space Agency (ESA) on the possibility of the Europeans obtaining one or more dedicated ESA pallets for the conduct of European science investigations. The ESA Science Advisory Committee (SAC) will meet with NASA on October 23, 1979, to discuss the utilization of individual pallets in addition to other topics.

The NASA Announcement of Opportunity (AO) solicits investigations from all nations and selects the best scientific investigations to meet the mission objectives. Frequently, foreign investigations are selected through the AO process. The investigator's government sponsors the cost of the instrument development and conduct of the investigation. As an example, Spacelab Mission 1, in addition to the ESA experiments, has Canadian, Indian, and Japanese experiments; and there are two British investigations being flown on Spacelab Mission 2. Additionally, several new foreign investigations were selected for development as a result of the latest AO.

QUESTION 3:

What type of institutional mechanism is needed for managing international scientific and/or material processing facilities?

Would a board of directors, composed of representatives from various countries, be the best mechanism for making decisions on utilization of these facilities and overseeing their operations?

Would international management add extensively to the costs?

ANSWER:

The institutional mechanisms needed for each facility will be a function of the nature (R&D versus operational) and purpose (observations for astronomy, materials processing research) of each space facility.

In the materials processing area, it would be very difficult, if not impossible, to operate these facilities with international management because of the desire of all parties to maintain secrecy of proprietary data.

In the area of science observations, the type of institutional arrangements will be an integral part of studies to define the specific facilities. Such factors as extent of international participation (hardware and investigations), observation time scheduling requirements, and management and cost effectiveness will be key factors in establishing the institutional mechanisms.

QUESTION 4:

What cost savings would you anticipate from utilization of a space platform rather than the Spacelab for space science experiments? A space platform rather than free-flyers?

ANSWER:

Concepts of a space platform program are just beginning to emerge. During the past year, we asked that the user community examine their discipline needs for space operations and to identify the types of instruments and procedures they would desire in a platform mode. The data shows that for missions of two months to three years, the cost of the platform would be lower than other methods of space science and application investigations.

These estimates, of course, are very preliminary and do not include payload development and integration costs. They were attractive enough to warrant further studies of platform program. We have initiated these studies and expect to have a much better understanding of the potentially cost-effective mode of flying experiments in the coming year.

QUESTION 5:

Please outline the Spacelab integration procedure. Do you foresee any difficulties for integration of international payloads into the Spacelab?

What are the legal and other considerations regarding international payloads in the U.S. space shuttle?

ANSWER:

There are basically six steps in the Spacelab payload integration process. They are:

- Staging Spacelab Elements - This operation consists of installing Spacelab functional components such as Remote Access Units (RAU), coolant lines and cold plates, etc., on the pallets and racks (Spacelab elements) in preparation for installation of the instruments.

- Instruments Integration with Spacelab Elements - Instruments are installed on pallets and in racks to make complete units.

- Combination of Spacelab Elements - Racks are integrated with the floor segments into an integral module complement and pallets are interconnected. This process also verifies the functional interfaces of the interconnections.

- Spacelab Subsystems Integration with the Integrated Spacelab Elements - At this point the actual flight subsystems are integrated with the Spacelab elements and functional tests are performed.

- Orbiter/Spacelab Interface Verifications - The integrated Spacelab is tested with an Orbiter subsystem simulator to verify functional interfaces and operations.

- Integrate the Spacelab with the Orbiter - The Spacelab is installed into the Orbiter bay and interfaces are connected and checked.

To date, we have not experienced unusual difficulties in integrating foreign investigations. Generally, they are handled the same way as U.S. investigations. Other than Spacelab 1, which is being handled as a joint mission, the first foreign payload of any significance, in terms of integration, will not occur until late 1983. This will be the West German Spacelab mission. By this flight, we expect that all of the operational difficulties will have been solved and sufficient variation of payloads and organizations will have been experienced to assure a smooth operation with the foreign payload and organization.

With respect to foreign payloads, we will ensure that the flight of each payload will not infringe on the U.S.'s obligation undertaken pursuant to treaty, international agreement, or other law. Thus, for example, NASA would only launch foreign payloads that are for peaceful purposes and compatible with the U.S.'s obligation under the Intelsat Agreement.

Moreover, we have taken care to advise foreign governments that a person over whom the foreign government has jurisdiction has requested launch services from NASA. Thus, the foreign government is put on notice in order that it may comply with its obligations under Article VI of the Outer Space Treaty requiring authorization and continuing supervision of non-governmental entities in outer space. It also puts the government on notice that in accordance with Article VI and the Convention on International Liability it will bear international responsibility for national activities in space.

Another area was allocating the risk of liability between the U.S. and foreign governments. NASA proposes to require all users, including foreign governments, to carry insurance protecting the U.S. Government from liability it may incur as a result of third-party claims. We have established a policy whereby NASA and all users of the Shuttle will be solely responsible for damage to their own property during space transportation systems operations.

NASA has dealt with a number of other Shuttle legal considerations in a September 12, 1977, memorandum which

was published in the House Hearings Before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, 95th Congress, May 17, 18, 1977, (No. 19), page 609.

QUESTION 6:

Do you think extension of the Spacelab orbit time from 7 to 30 days will increase the attractiveness of Spacelab for the conduct of space science? Will it increase cost? Will increases in power availability for researchers make the Spacelab more attractive?

ANSWER:

There are many specific scientific and applications experiments which would significantly benefit from a 30-day orbit, in particular, life science investigations into the effects of gravity on the growth of plants; identification of large scale magnetic field patterns, and studies of the structure of the solar corona. All of these involve phenomena which occur on a 7- to 30-day cycle. Also, low frequency solar events and cosmic events such as solar flares and coronal transients and gamma ray sources would be more easily detected. These are only a few of the many discipline activities which would benefit materially from 30-day missions. Consequently, 30-day missions would certainly attract a great deal of interest from the scientific community.

There is some capital investment required to provide the Orbiter with the capability to stay on orbit for 30 days. However, in terms of space transportation systems operations cost, the improvement would be cost effective.

QUESTION 7:

Do you have any suggestions on how space science users of the Spacelab and/or future space platforms might be aggregated to lower costs?

ANSWER:

The overriding criterion leading to a collection or aggregation of Spacelab instruments will probably be the discipline area to be investigated. The primary objective of the mission (stellar astronomy, solar physics, etc.) will influence what compatible instruments might be included. This approach may result in reduced mission planning activities for observation times, Shuttle maneuvers and pointing stability. Another technique which may prove promising is to assemble the related instruments into a manageable group which fully utilizes a single payload carrier (i.e., a pallet). The payload element will be equipped with sufficient subsystems to make it essentially

autonomous and can easily be loaded and unloaded into the cargo bay with minimum services required (power and communications). The latter approach may be attractive for instruments which will be reflown several times and is consistent with a space platform mode of operation.

QUESTION 8:

It is my understanding that free-flying materials processing facilities are being investigated as follow-ons to materials processing experiments on the space shuttle.

What types of problems might be encountered with international use of a U.S. owned/operated facility, particularly since material processing can become highly competitive? With a U.S. owned/internationally operated facility?

Would security be a likely problem, both in terms of assuring no unauthorized access to information gained from experiments on these facilities and in terms of safe retrieval of the material produced.

ANSWER:

Due to the highly competitive environment of the materials processing industry, industrial firms go to great lengths to guard their trade secrets not just from international competition but from domestic competition as well. NASA is very much aware of the problems inherent in the protection of commercial proprietary information and is extremely sensitive to it. Thus, regardless of who owns and/or operates a materials processing facility, whether attached to a shuttle or in a free-flying mode, provision must be made to provide the same levels of protection. When flying commercial investigations, for example, Germany, Japan, and the U.S. will fly independently-funded missions to assure the maximum protection to their commercial interests.

With respect to the last question, we do not expect to encounter any insurmountable problems since NASA has established a "good track record" in protecting proprietary data with aerospace contractors. We do expect, however, that new procedures will be required. These are now being identified and developed for implementation in our joint endeavor activities.

QUESTION 9:

Have other countries indicated interest in placing experiments aboard an international materials processing facility?

Is there any indication that individual countries would prefer to have their own facilities, using their own astronauts flown on space shuttle to retrieve the experiments rather than relying on the U.S.?

ANSWER:

While several foreign countries are now taking steps to establish a Materials Processing in Space (MPS) technology base, their interests in an international facility have been limited to cooperative fundamental materials science research activities, the results of which are made available to any interested organization or individual. Because of the increased likelihood of trade secrets being leaked through the multiple interfaces of an internationally operated facility, U.S. and foreign firms are extremely reluctant, if not totally opposed, to undertaking materials processing activities having possible commercial application in such a facility. To this end, Germany is now developing an independent capability to conduct materials processing experiments aboard the Spacelab. Japan is studying alternative ways of establishing an independent materials processing base in space technology. These Spacelab missions will be fully paid for by the individual countries and will involve their own payload specialists as well. We expect that this philosophy of developing independent capabilities for commercial purposes utilizing the Spacelab will extend to the free-flying mode. NASA is studying the prospect of a similar course in developing an independent capability for the U.S.

QUESTION 10:

How would potential problems with free-flying materials processing facilities differ from those of materials processing experiments conducted on the space shuttle?

What security measures are being planned for materials processing experiments on the shuttle?

ANSWER:

A number of commercially promising MPS processes are expected to rapidly exceed the practical capabilities of the Shuttle in an attached mode. In this mode, energy available to the payloads and the cost of keeping the Shuttle in orbit severely limits the number of processes that can be completed in a mission and this will result in an exceedingly high cost per unit processed. A free-flying MPS capability, presently envisaged as a Materials Experiment Carrier (MEC) operating in conjunction with the 25 KW Power System, will significantly reduce the cost of MPS which is a key factor in commercial applications of this technology. Even with a free-flying capability such as the MEC, the MPS activity will remain a costly proposition compared with ground-based operations. While NASA expects a number of commercial applications to result, we must continue to pursue further means of reducing costs to a point where the expense of MPS technology is comparable to that of ground-based materials processing. A key to this goal is increasing the number of

units processed per flight thereby decreasing the per unit cost. In connection with the MEC activities, automated techniques including robotics and telefactoring are being explored to accomplish this end.

With respect to the last question, new procedures are required to protect the proprietary aspects of each material processing experiment. These procedures are now being identified and developed for implementation in our joint endeavor activities.

QUESTION 11:

What special problems are likely to develop with the safeguarding of materials and knowledge from materials processing facilities vis-a-vis services located on a multipurpose space platform (communications, earth resources, weather, etc.)?

ANSWER:

Consolidated with QUESTION 9.

QUESTION 12:

What is the U.S. liability if a U.S. astronaut errs and ruins another country's materials processing or scientific experiment either on the shuttle and its related hardware, or on a free-flying facility of the future?

ANSWER:

The U.S. Government would not be responsible for damage to another country's materials processing of scientific equipment on the Shuttle or during other space transportation system operations. We will include a cross-waiver provision in each Shuttle Launch Services Agreement whereby both NASA and the user, including foreign countries, agree to a no-fault, no-subrogation waiver of liability under which NASA and the user will be solely responsible for any damage to its own property involved in such operations.

QUESTION 13:

What is the current status and scope of international cooperation with the Space Telescope?

Will the Space Telescope be managed as an international facility, or as a U.S. facility to which scientists from around the world have periodic access for specific experiments?

Could the Space Telescope be used as a prototype for international management of orbiting space science facilities?

ANSWER:

ESA's contributions to the Space Telescope Program are covered by a Memorandum of Understanding signed on October 7, 1977. Under this agreement, ESA will provide one of the scientific instruments, the faint object camera; the solar array which will provide power for the telescope; a number of personnel for the science operations staff; and assistance in the on-orbit maintenance and major refurbishments of the telescope. Both the faint object camera and the solar array are in the final design stage of development.

It is anticipated that other foreign countries will become involved in the program during the operational phase through proposals for observing programs and new instrument developments.

Scientific operations of the Space Telescope will be managed as a U.S. facility by a science institute under NASA contract. Foreign participation in such management will be involved through the operations personnel furnished by ESA.

A decreasing fraction of the telescope viewing time will be allocated to astronomers who were selected on a competitive basis to assist in the development phase of the project. All other observing time will be allocated on a scientifically competitive basis, independent of nationality. Within this system, it is intended and expected that ESA-sponsored scientists will use at least 15 percent of the observing time, on the average, over the lifetime of the telescope.

The Space Telescope Program is basically a U.S. program with international participation. As such, the management elements of the program are the sole responsibility of the U.S. In addition to ESA's contributions stated above, international participation during the program development phase includes ESA membership in the Space Telescope Science Working Group.

QUESTION 14:

Reference to figure 4, what mechanism has been established for selecting "international" experiments for Spacelab?

ANSWER:

The U.S. selects experiments through the AO process as described to the Subcommittee. In addition to the international community responding and being selected by the NASA AO process, several other ways are evident in the international activity. For example, the instruments for the Spacelab 1 mission are being provided by NASA and ESA. For this mission, NASA used the AO process to select instruments while ESA issued its own announcement to the European community and selected their instruments. In another way, a single country can purchase a total Spacelab/Shuttle mission and, by its own process, select instruments for the flight. A commercial enterprise could conceivably also purchase a mission and invite participation by the international community.

QUESTION 15:

On the bottom of page 3, you indicate NASA has come to realize "totally integrated" Spacelabs are too expensive and a new concept is being employed. Could you describe what these differences are? What do you expect are the relative costs?

ANSWER:

The integration phase refers only to integrating experiment equipment and mission peculiar equipment onto Spacelab modules and pallet combinations. This is what we call the totally integrated Spacelab system.

Our integration experience to date has led us to generally conclude that we must find innovative ways to reduce the integration complexity, thus reducing cost, and utilize Spacelab as a true laboratory in space. NASA recognizes that Spacelab Missions 1 and 2 have dual objectives, i.e., to demonstrate the Spacelab system capability and to obtain multi-discipline scientific data, and the integration efforts on these missions do not accurately reflect the effort required for an operational system. Our goal, therefore, is to transition early into an operational era such that Spacelab becomes a cost-effective, unique capability which offers new opportunities in the exploration and use of space.

We are just beginning to examine what new methods will be required and which can be shared at some signficiant cost savings. We will implement any new approach as quickly as feasible.

QUESTION 16:

What prospects are there for international sharing of space science platform development costs?

Do you believe it would be in the national interest to arrange such a cooperative activity?

ANSWER:

Let me reiterate, we are only in the very early stages of assessing the feasibility of a space platform program. We have a lot of work to do before a decision can be made. If a platform program can be structured which satisfies the science and application user communities and also be cost effective compared to other methods of accomplishing our missions, NASA would then consider what options would be viable for developing the platform flight hardware. Experience indicates that the best method to share the development program occurs when a specific and distinct item can be supplied by each participant. It is just too early in the platform studies to speculate on detailed items at this point.

Certainly, if a platform program does become attractive when better defined, we should consider potential cooperative activity as we have done in the past. Until more specifics concerning the exact nature of this cooperation can be determined, any comment regarding this activity and the national interest would be premature.

Material requested for the record on page 49, line 20, by Honorable Winn during the hearing before the House Subcommittee on Space Science and Applications on September 5, 1979.

The Spacelab 1 payload specialists were brought on-board in August 1978. Of the five selected, two are sponsored and funded by NASA and three are sponsored and funded by the European Space Agency (ESA) and are now employees of ESA. The two NASA payload specialists are non-government employees and are funded through contracts with the investigators who nominated them. The SL-1 payload specialists training program has been revised each time the Shuttle launch schedule slipped. The "extra time" has been taken up by rescheduling (adding to) their duties so that they can help develop mission operation timelines and training plans for the Payload Operations Control Center (POCC) and for on-orbit instrument operations. The cost impact of launch delays for the two SL-1 payload specialists is estimated to be approximately $13,000 a month; however, their compensated time will be productively employed with duties such as those identified above.

For both missions, SL-1 and SL-2, the payload specialists have been selected by the principal investigators functioning through the Investigators Working Group (IWG) established for each mission. The payload specialists selected are members of the scientific community, and for SL-2 are co-investigators. The IWG's have expressed concern from the very beginning that the payload specialists will lose their basic professional proficiency because of being away from their respective laboratories too long. To minimize this concern, the IWG requested that the training schedules be structured to permit the payload specialists an opportunity to spend some time periodically in their home laboratories in order to maintain their professional credentials.

On the SL-1 mission the training planning was not as responsive to the IWG's request. Although these payload specialists are associated with an investigators laboratory they are not co-investigators like those on SL-2. The SL-1 mission has a large number of investigations with money provided by the European scientific community. Extensive travel of the payload specialists is required for training with the investigators at their laboratories. Consequently, the launch delays have permitted optimizing an otherwise rigorous schedule in addition to creating some extra time.

The SL-2 payload specialists selection and training is more representative of the procedures we will employ on future missions and is responsive to the IWG's request. The four payload specialists (two will fly) selected are co-investigators who form a part of the scientific team. Consequently,

the budget established for the payload specialist program for SL-2 will have a minimum impact by launch slips since these personnel must perform as science team members part of the time and payload specialists part of the time. The contracts or agreements with the (three civil servants and one non-civil servant) sponsoring organizations are such that NASA can adjust their time and duties on training activities to be compatible with the launch schedule.

Mr. FUQUA. The next witness will be Dr. B. I. Edelson, vice president, Systems Technology Services.

We are happy to have you and are pleased to hear your testimony.

Without objection, we will make your entire statement a part of the record, and you want to summarize it you said.

[The prepared statement of Dr. Burton I. Edelson is as follows:]

STATEMENT ON "SATELLITE COMMUNICATIONS—TECHNOLOGY, SYSTEMS, BUSINESS"

(By Burton I. Edelson, Vice President, Communications Satellite Corporation)

Mr. Chairman, it is an honor for me to be here and to participate in these important hearings on International Space Activities. My subject today is satellite communications.

In my statement, I would like to emphasize the great technological progress that has been made in this field over the past two decades; how this technology has led to operating systems; and how these systems have created a global business. I would also like to address current technology trends and their potential impact on future systems and services, including the possibility of large geostationary platforms. Lastly, I intend to mention some development problems.

I have just termed satellite communications a "business". Today, it truly is—with total revenues of over a billion dollars a year, employing thousands of people, and providing useful and profitable services to institutions and individuals in a hundred countries. Think for a moment that at one instant 10,000 people around the world may be talking by telephone via satellite; and literally millions of others may be watching television, also via satellites. In addition, digital data measured in millions of bits per second can flow through the same satellites carrying electronic mail, transferring funds, reporting stock market activities, and connecting networks of computers around the globe.

President Kennedy set the stage for this global business at the beginning of the last decade. In his prescient policy statement issued on 24 July 1961, he recognized the potential commercial importance on earth orbiting satellites, and declared it to be U.S. policy to develop satellite communications through the private sector. He also recognized the international implications of this technology:

"I invite all nations to participate in a communications satellite system, in the interest of world peace and closer brotherhood among peoples of the world."

Following this policy statement, the U.S. Congress enacted the Communications Satellite Act of 1962; COMSAT came into existence in 1963; INTELSAT (the International Telecommunications Satellite Organization) was formed in 1964; and the first commercial satellite was launched and commenced operation in 1965.

INTELSAT PROGRESS

Through the remainder of the 60's and all of the 70's, international satellite communications has grown qualitatively and quantitatively, evolving into today's extensive system. INTELSAT, with 102 member countries, has just celebrated its fifteenth birthday. Its system has grown to include 11 operational and standby satellites providing a global communications network with an in-orbit capacity of 50,000 telephone circuits. In all, INTELSAT handles about two-thirds of the world's transoceanic traffic.

One hundred and three countries on six continents now operate 250 earth stations in the INTELSAT network. These countries include, incidentally, both Russia and China, Israel and the Arab nations, and the latest entering service just last week with a telecast to Yugoslavia, was Cuba.

In addition to international communications, the INTELSAT system also provides leased capacity to sixteen countries for their own domestic communications requirements.

Through INTELSAT, the world has seen much momentous events as man's first moonstep and the Olympic Games in Munich and Montreal. It was through INTELSAT that the 1978 World Cup Soccer became the world's largest TV event with an estimated audience of one billion viewers. Worldwide live coverage of news and sporting events is now an everyday commonplace affair.

But one of INTELSAT's most significant achievements has been in cost reduction. INTELSAT's 1979 charge for a telephone circuit is less than 1/5 (some

18 percent of its original charge in 1965. Moreover, INTELSAT is profitable for its participants. From its revenues of almost $200 million this year it will pay about 14 percent return on investment to its members. The users of the system also profit as communications carriers.

DOMESTIC AND MARITIME SYSTEMS

The same electronics and space technology that made international communications possible also works for domestic, maritime and other services. In the early 70's, several such systems were developed. Canada, in 1972, was the first nation to inaugurate its own domestic system. The United States now has three domestic systems WESTAR, SATCOM and COMSTAR, and a fourth SBS under development. Indonesia has a separate system. The Arab countries, the Nordic countries, France, India and others are planning separate domestic and regional systems. The geostationary orbit and the allocated frequency spectrum for satellite communications are just beginning to be strained.

In 1976, the first of a series of three MARISAT satellites was launched to provide global satellite communications service to ships at sea. This system is operated very successfully by COMSAT General Corporation with the participation of several other U.S. carriers, and provides high-quality telephone and telex service to ships at sea around the world. At present, about 240 ships flying the flags of a dozen nations are equipped with satellite communications terminals. The introduction of maritime satellite service by the United States has stimulated interest by many other nations and led to the formation of INMARSAT—an organization initially of 28 countries to provide international maritime satellite services. It is interesting that INTELSAT is now planning to accommodate a maritime capability for INMARSAT on several future INTELSAT V satellites. (This hints at a subject I will address in a moment, the effectiveness of combining several payloads on one space platform.)

As we approach the close of the seventies decade, we can really appreciate the results of President Kennedy's initiative in the early sixties. Experimentation has developed into operating systems and systems into viable businesses. Certainly, no effort in the U.S. space program has yielded more direct and obvious benefits; and none has had more international involvement than satellite communications.

TECHNOLOGICAL PROGRESS

Tremendous technological progress has been made in both satellite and earth station technology in the INTELSAT system during its 14 years of operation. Whereas, the Early Bird Satellite weighed 38 kilograms and carried the equivalent of 240 telephone circuits, the INTELSAT IV–A satellites in current operation weigh 863 kilograms and carry some 6,000 telephone circuits; the INTELSAT V satellite will weigh 967 kilograms and have a capacity of 12,000 telephone circuits!

The Intelsat V satellies I have just mentioned, currently under construction by Ford Aerospace and Communications Company, is due to be launched early in 1980. (See Figure 1.) This satellite will represent a major step forward in technology and in operational capability. The Intelsat V satellite will attain its capacity of 12,000 telephone circuits, as mentioned above by virtue of its 1,200 watts of electrical power, its effective 2,300 MHz of bandwidth, and its very high-performance, multi-frequency, multibeam antenna system. The satellite will use both the 6/4 and the 14/11 GHz frequency bands. It will have 15 receivers, 43 transmitters, and over 100 antenna feed elements. It will make very extensive use of microwave integrated circuitry. Visually, the most striking features of the Intelsat V satellite are its long solar array "wings" (16 meters tip to tip) and its complex antenna "farm." The antennas and feed systems are mounted in a very unique lightweight graphite reinforced tower—all precisely body stabilized along 3 axes.

A clear trend to note at this point is that larger, more powerful satellites have permitted the use of smaller, less expensive earth stations. Whereas the Intelsat system has employed very large earth stations to interconnect the terrestrial communication networks of different countries, regional and domestic systems employ much small earth stations to interconnect individual users. For example, the Intelsat standard "A" earth station uses a 30-meter aperture, costs some $5 million, and is remotely located; the Intelpost standard "B" earth station uses a 10-meter aperature, costs about $15 million and may be located

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close to cities; small earth stations now being introduced into domestic systems may utilize a 5-meter dish, cost less than $50,000, and can be located at the customer's premises—on his roof or in his parking lot.

These earth stations will employ digital techniques for processing, coding, modulation, and multiple access in order to gain maximum system efficiency and performance. Error control to very high levels ($<10^{-9}$, or less than one error in a billion bits) will become increasingly important for new services such as electronic mail, electronic funds transfer, and other forms of computer networking. Therefore, small customer-premises earth stations using digital techniques are expected to come into widespread use, not only in special-purpose and domestic systems but eventually for international service as well.

On-board processing in the satellite should come into use in the mid-1980's. First, switching among satellite beams at microwave frequencies will be introduced; and ultimately demodulation to baseband in the satellite will allow complex processing—switching, signalling, multiplexing, and regeneration of signals—to take place. Satellites to incorporate these features will require large and complex multibeam antennas and feed systems. All of this represents a marked trend in the direction of increased size and complexity in the space segment to provide smaller, simpler, and less expensive earth terminals.

GEOSTATIONARY PLATFORMS

The trend toward larger satellite will undoubtedly continue and the availability of the Space Shuttle in the 1980's should encourage this trend. The Shuttle, used with high energy upper stages, will have the capability of placing extremely heavy and complex payloads into orbit. These payloads can be erected and assembled in low earth orbit, and then boosted into geostationary orbit where they can be maintained and serviced over long periods of time. During the 1980's, the capability should be developed to perform this role in a reliable and cost-effective manner.

Large geostationary platforms may be used to carry quite a number of payloads and perform multiple missions, thus replacing many separate small satellites performing individual missions. The missions, incidentally, may include others besides communications, such as earth resource observation and meteorological service, which would also bentfit from being in geostationary orbit. Combining many such missions on a single platform should result in significant economies of scale. Other advantages of geostationary platforms include the ability to interconnect missions—international and maritime service, for example; and conservation of orbital arc and radio frequency spectrum through the efficient use and multiple re-use of several frequency bands.

Artist's concepts and drawings of geostationary platforms have shown them bristling with many antennas of different types and sizes, thus they have been termed "orbital antenna farms" (OAF's). "Geo-platforms," "OAF's," or "Switchboards in the Sky" (another term), by whatever name, will come about, I believe, by evolution and development for operational service in the 1990's.

The eventual realization of these large platforms is probably inevitable, but still there are a number of problems that will be encountered in growing from present-day communications satellites (under 1,000 kg) to the very grand and large platforms predicted for the 1990's (perhaps 10,000 kg or more).

First, there are a number of technical problems involved in the interconnection, mutual support, and prevention of interference between and among payloads. These are problems which engineers can and are solving (e.g., ATS–6, Intelsat V, TDRSS).

Second, there are technical problems involved in erecting and assembling large structures in space, combining the payloads of several orbiters. NASA has several good development programs in this area and expects to push these through the 1980's.

Third, there are institutional problems. Who should own and operate geo-platforms? How to get the potential users of platforms to work together and to share resources? Although such problems are not amendable to engineering solutions, it does seem that if the promised economies are sufficiently great, other problems will be solved. (Fortunately, Del Smith, also on our program today, has been effectively addressing the institutional problems.)

Fourth, there are launch system problems. The Space Shuttle program is behind schedule at present, and there is not an adequate upper stage vehicle under

development for large platforms. Many space programs including INTELSAT have been planning on the use of the Shuttle for missions of the early and mid-eighties. Due to schedule slippages, some of these missions will have to use more expensive conventional U.S. vehicles such as Atlas-Centaur, or those of other countries such as Ariane, advertised as being less expensive. This is a significant problem, but one of which NASA is well aware and is working on very hard. I would certainly endorse any effort that can be exerted, or any funds that could be provided to maintain or possibly improve the Shuttle schedule.

The Shuttle Orbiter, as you know, opens its bay doors and places payloads into a low-earth orbit (a few hundred kilometers). Additional rocket thrust from an upper stage is required to go to the geostationary orbit altitude (35,800 km). Several upper stages are under development, but none are adequate for the full Shuttle bay payload capability.

In order to fully utilize the Shuttle, a high-performance upper stage with low-thrust capability is needed. Low thrust would enable the Shuttle to utilize its manned capability to deploy and check out the platform at its antenna farm in low-earth orbit. The low-thrust stage would then gently transfer the deployed spacecraft to its desired location in geostationary orbit.

It would seem highly desirable for NASA to utilize an existing high-energy, low-thrust upper stage, such as the Centaur, for transferring heavy spacecraft from low to geostationary orbit. The Centaur, the same upper stage used for launching INTELSAT IV's, IV–A's, and V's, if used in conjunction with the Shuttle could place about 4,800 kg into geo-orbit. That would be a good-sized platform—one that would measure some 90 meters in diameter in a typical arrayed configuration. The future potential for growth and for economy of such an upper stage would be appreciable.

Although some very large geostationary platforms have been suggested (and I myself have written about them), it would seem that the first attempt at developing the concept should involve an experimental platform based upon only one Shuttle launch. Such a platform could be large enough (say 4,000 kg) to provide a good test of the concept but would eliminate a need for the rendezvous of two orbiters with extensive structural joining and assembly in space. It would also keep costs and institutional problems at a minimum.

Specifically, I would suggest that NASA begin now the definition and development of an experimental flight system for launch in the mid-1980's to demonstrate in space on a single Shuttle-launched platform the necessary technologies, systems, and operational capabilities. This experiment or demonstration system would serve as a model for the operational geostationary platforms which would follow. It could serve as a development step or forerunner to test out the platform structure, deployment mechanisms and other sub-systems, and at the same time accommodate advanced communications payloads such as NASA's experimental 30/20 GHz multibeam system, a large aperture (say 15-meter) multibeam 6/4 GHz system and a 14/11 GHz system—all interconnected with a switch. This platform could be operated for several months to conduct engineering tests of communications and platform sub-systems, after which it could be used to accommodate a variety of user experiments like those in the ATS program. Also, demonstrations for potential commercial users like INTELSAT and communications carriers could be conducted. Furthermore, if the timing of this platform is compatible with NASA's schedule to develop a high-energy, low-thrust upper stage for the Shuttle, such as I have mentioned, the platform might be delivered by this new system.

SUMMARY

Let me summarize my statement by saying that the past rapid pace of development of satellite communications should continue with a very bright and productive future. Business applications should increase. Technology in this field is advancing very rapidly. That allows us to predict larger, more complex spacecraft; smaller, cheaper, more adaptable ground terminals; extensive digital transmission systems; and an ever-broader range of useful services. I see the geostationary platform or "orbital antenna farm" as the natural culmination of the growth in size and complexity of spacecraft, and I predict that the introduction of this concept will lead to better, more cost effective services. Some technical and institutional problems remain; but with a strong continuing development program U.S. leadership in this important field will continue, and all will benefit.

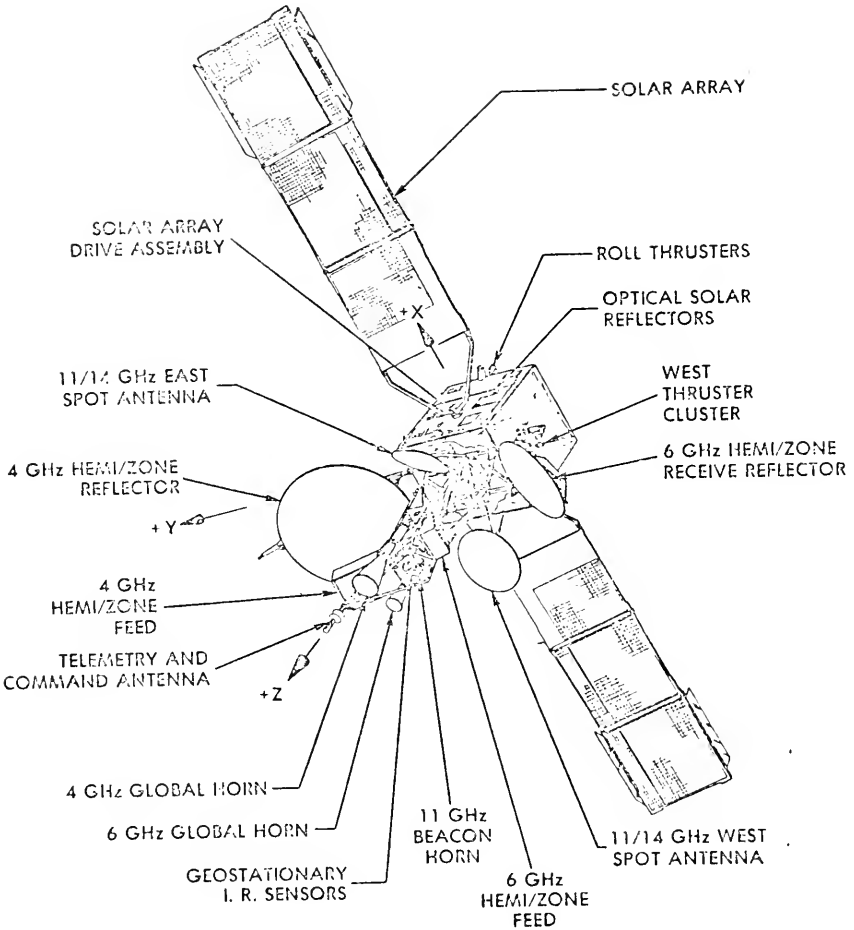
SOLAR ARRAY
SOLAR ARRAY DRIVE ASSEMBLY
ROLL THRUSTERS
OPTICAL SOLAR REFLECTORS
+X
11/14 GHz EAST SPOT ANTENNA
WEST THRUSTER CLUSTER
6 GHz HEMI/ZONE RECEIVE REFLECTOR
4 GHz HEMI/ZONE REFLECTOR
+Y
4 GHz HEMI/ZONE FEED
TELEMETRY AND COMMAND ANTENNA
+Z
4 GHz GLOBAL HORN
6 GHz GLOBAL HORN
11 GHz BEACON HORN
11/14 GHz WEST SPOT ANTENNA
GEOSTATIONARY I. R. SENSORS
6 GHz HEMI/ZONE FEED

FIGURE 1

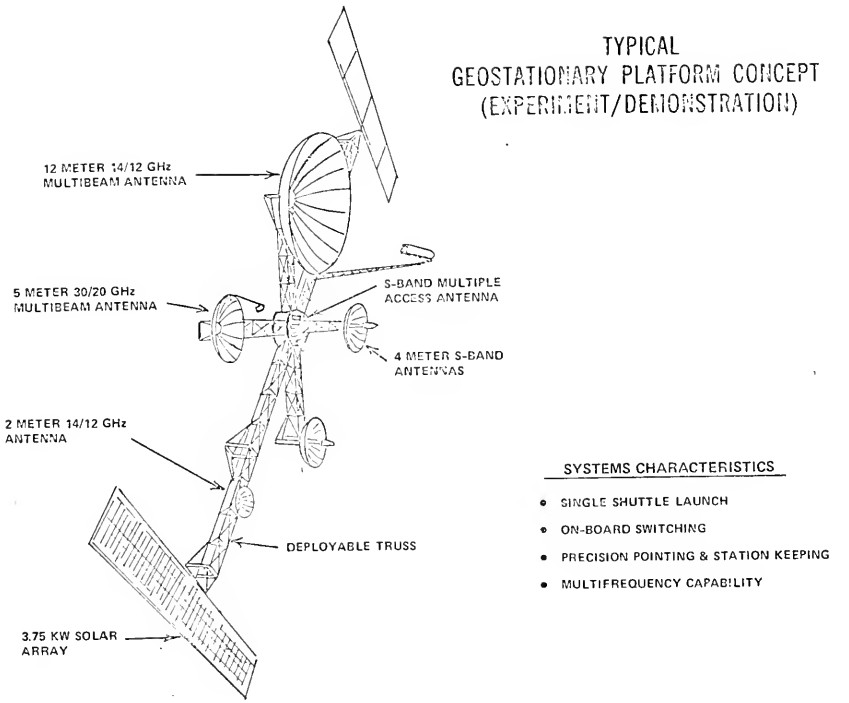

FIGURE 2

STATEMENT OF DR. BURTON I. EDELSON, COMSAT

Dr. EDELSON. It is an honor for me to be here and to participate in these important hearings on international space activities. My subject today is satellite communications.

In my statement, which I shall submit for the record and which I will abstract today, I would like to emphasize the great technological progress that has been made in the satellite communications field over the past two decades.

Mr. FUQUA. Very well. You may proceed.

Dr. EDELSON. Thank you, sir.

I would like to emphasize today the tremendous progress we have made in the past and how this technology has led to operating systems and how these systems have created a global business. Then I would like to address future potentials, particularly geostationary orbit platforms, and last I intend to mention some development problems.

I have just termed satellite communications a "business." Today it truly is, with total revenues of over $1 billion a year, employing thousands, in fact, tens of thousands of people and providing useful and profitable services to institutions and individuals.

The field of satellite communications is two decades old, kicked off by President Kennedy's policy statement in 1961, followed by the Communications Satellite Act of 1962, the formation of Comsat Corporation in 1963, the formation of Intelsat in 1964, and the launch of the first commercial satellite, Early Bird, in 1965—very rapid progress, indeed, in inaugurating commercial satellite communications, but the pace of progress has definitely not slowed up in the last 15 years. If anything, it has increased, and today we have a vast global system in Intelsat.

One hundred and three counties on 6 continents now operate over 250 Earth stations in the Intelsat networks. These countries, incidentally, include both the Soviet Union and China, Israel, and the Arab nations, and the latest station was inaugurated in Cuba just this last week.

In addition to international communications, the Intelsat system also provides leased capacities to 16 countries for their own domestic communications requirements.

May I emphasize that Intelsat itself is a business, profitable. From its revenues of almost $200 million this year, it will pay about 14 percent return on investments to its participants. Also, the users of the system, communications carriers, operate profitable enterprises.

The very same electronics and space technology that has made international communications via satellite successful also works for domestic, maritime, and other services. There are several domestic satellite services in operation today, and more planned. The United States now has three domestic systems, Westar, Satcom, and Comstar, and a fourth, the SBS system, under development.

Also the world has an operating maritime system based on the Marisat satellites providing a global capability with 240 ships flying the flags of over a dozen nations now equipped with satellite communications terminals. It is truly an operating business with international, domestic, and maritime implications.

Tremendous technological progress has been made in both satellite and Earth stations in the past two decades. To summarize the trends I would make three points. The satellites have grown larger and more powerful and more complex. The Earth stations have grown smaller, less exepnsive and more adaptable to the users needs, capable of being located close to or on the users' premises, on his roof or in his parking lot, or if the user is aboard ship, on deck or in his yard arm.

The third is the move toward digital transmission techniques not only for data, but for video, voice, facsimile, and other services.

The trend toward larger, more complex statellites will undoubtedly continue, and the availability of the Space Shuttle in this next decade

should encourage this trend. The Shuttle used with high-energy upper stages will have the capability of placing extremely heavy and complex payloads into orbit. These payloads can be erected and assembled in low Earth orbit, and then boosted into geostationary orbit where they can be maintained and serviced over long periods of time. During the 1980's, the capability should be developed to perform this role in a reliable and cost-effective manner.

Large geostationary platforms may be used to carry quite a number of payloads and perform multiple missions, thus replacing many separate small satellites performing individual missions. The missions, incidentally, may include others besides communications, such as Earth resource observation and meteorological service, which would also benefit from being in geostationary orbit. Combining many such missions on a single platform should result in significant economies of scale. Other advantages of geostationary platforms include the ability to interconnect missions—international and maritime service, for example—and conservation of orbital arc and radio frequency spectrum through the efficient use and multiple re-use of several frequency bands.

Artist's concepts and drawings—one is attached to my statement and I hold one here—of geostationary platforms have shown them bristling with many antennas of different types and sizes, thus they have been termed "orbital antenna farms." "Geo-plaforms," "OAF's," or "Switchboards in the Sky" (another term), by whatever name, will come about, I believe, by evolution and development for operational service in the 1990's.

The eventual realization of these large plaforms is probably inevitable, but still there are a number of problems that will be encountered in growing from present-day communications satellites, under 1,000 kilograms to the very grand and large platforms predicted for the 1990's, perhaps 10,000 kilograms or more.

First, there are a number of technical problems involved in the interconnection, mutual support, and prevention of interference between and among payloads. These are problems which engineers can and are solving—for example, ATS–6, Intelsat V, TDRSS. In fact, many of them have been solved.

Second, there are technical problems involved in erecting and assembling large structures in space, combining the payloads of several orbiters. NASA has several good development programs in this area and expects to push these through the 1980's.

Third, there are institutional problems. Who should own and operate geo-platforms? How to get the potential users of platforms to work together and to share resources? Fortunately, Dr. Del Smith, also on our program today, has been, and I am sure will deal with these institutional problems.

Fourth, there are launch system problems. The Space Shuttle program is behind schedule at present, and there is not an adequate upper stage vehicle under development for large platforms. Many space programs, including Intelsat, have been planning on the use of the Shuttle for missions of the early and mid-1980's. Due to schedule slippages, some of these missions will have to use more expensive conventional U.S. vehicles, such as Atlas-Centaur, or those of other countries such as the ESA Ariane vehicle advertised as being somewhat less

expensive. This is a significant problem, but one of which NASA is well aware and is working on very hard.

I would certainly endorse any effort that can be exerted, or any funds that could be provided, to mantain or possibly improve the Shuttle schedule.

The Shuttle Orbiter, as you know, opens its bay doors and places payloads into a low-Earth orbit—a few hundred kilometers. Additional rocket thrust from an upper stage is required to go to the geostationary orbit altitude of 35,000 kilometers. Several upper stages are under development, but none are adequate for the full Shuttle bay payload capability.

In order to fully utilize the Shuttle, a high-performance upper stage with low-thrust capability is needed. Low thrust would enable the Shuttle to utilize its manned capability to deploy and check out the platform at its antenna farm in low-Earth orbit. The low-thrust stage would then gently transfer the deployed spacecraft to its desired location in geostationary orbit.

It would seem highly desirable for NASA to utilize an existing high-energy, low-thrust upper stage, such as the Centaur, for transferring heavy spacecraft from low to geostationary orbit. The Centaur, if used in conjunction with the Shuttle, could place about 4,800 kilograms into geostationary orbit. That would be a very good-sized platform—one that would measure some 90 meters in diameter in a typical arrayed configuration. The future potential for growth and for economy of such an upper stage would be appreciable.

Although some very large geostationary platforms have been suggested—and I myself have written about them—it would seem that the first attempt at developing the concept should involve an experimental platform based upon only one Shuttle launch. Such a platform could be large enough, say 4,000 kilograms, to provide a good test of the concept and a useful service, but it would eliminate a need for the rendezvous of two Orbiters with extensive structural joining and assembly in space. It would also keep costs and institutional problems at a minimum.

Specifically, I would suggest that NASA begin now the definition and development of an experimental flight system for launch in the mid-1980's to demonstrate in space on a single Shuttle-launched platform the necessary technologies, systems, and operational capabilities. This experiment or demonstration system would serve as a model for the operational geostationary platforms which would follow.

Let me summarize my statement, Mr. Chairman, by saying that the past rapid pace of development of satellite communications should continue with a very bright and productive future. Business applications should increase. Technology in this field is advancing very rapidly. That allows us to predict larger, more complex spacecraft; smaller, cheaper, more adaptable ground terminals; extensive digital transmission systems; and an ever broader range of useful services.

I see the geostationary platform or "orbital antenna farm" as the natural culmination of the growth in size and complexity of spacecraft, and I predict that the introduction of this concept will lead to better, more cost-effective services. Some technical and institutional problems remain, but with a strong continuing development program,

U.S. leadership in this important field will continue, and all will benefit.

Mr. FUQUA. Thank you very much, Dr. Edelson, for your comments. If you could wait for a few moments, we could then proceed with questions.

Our next witness is Dr. Delbert D. Smith, an Attorney at Law, who has been before the committee many times. We are always happy to welcome you back.

Without objection, your full remarks will be included and you may summarize.

[The biographical sketch and prepared statement of Dr. Delbert D. Smith are as follows:]

DR. DELBERT D. SMITH

Dr. Delbert D. Smith, Attorney at Law, received a Ph.D. in International Law from Cambridge University, Cambridge, England; a J.D. from the University of Wisconsin; a Master's Degree in Political Science from the University of Wisconsin; and the Diploma in Public International Law from The Hague Academy of International Law, The Hague, The Netherlands.

Dr. Smith, the author of "International Telecommunication Control" (1969), "Communication via Satellite: A Vision in Retrospect" (1976) and "Teleservices via Satellite" (1978), has published in American and British legal periodicals, and is the editor of Satellite Communications magazine. His latest book, "Space Stations: International Law and Policy," will be published in October of this year. He has taught international law at Cambridge University, lectured widely on telecommunications policy, and has presented papers at numerous professional society conferences. He is presently working on a book on space policy for the 1980s.

STATEMENT OF DR. DELBERT D. SMITH, ATTORNEY AT LAW, ON INTERNATIONAL UTILIZATION AND MANAGEMENT OF SPACE SYSTEMS

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear before you this afternoon to discuss the domestic and international utilization of large space structures. I am concerned with directions and routes with regard to the implementation of teleservices from space stations. In particular, I am concerned with the need to consider the institutional arrangements that will be necessary to allow us to reach the destination of an operational space station. That, together with a determination of the core teleservices to be provided are issues basic to the process of space technology integration.

> As important as the question of destinations are questions of directions and routes. A destination may seem very desirable, but if there is "no route" from here to there (or if we cannot find the direction that sets us on this route), then the destination is irrelevant.
>
> —Herman Kahn, Toward the Year 2000

As one of the focal points for Congressional leadership in the area of space industrialization, the House Subcommittee on Space Science and Applications has long recognized the benefits that can be derived from the expanded utilization of outer space.[1] In addition, with the advent of the National Aeronautics and Space Administration's Space Transportation System (STS), the subcommittee is aware that the technological capability to develop wide-scale beneficial utilization of outer space is present. Moreover, the Subcommittee is aware that one of the next steps in translating the STS capability into positive and greatly expanded beneficial space applications is the development of large space structures and space platforms.[2]

[1] Among the major space related reports that describe the benefits which can be derived from outer space are: Space Industrialization, Rockwell International Space Division (April 14, 1978); Space Industrialization Study, Science Applications, Inc. (April 15, 1978); Federal Research and Development for Satellite Communications, Space Applications Board, National Research Council (1977) and Practical Applications of Space Systems, Space Applications Board, National Research Council (1975).

[2] The concept of large space structures, and in particular multipurpose space platforms located in geostationary orbit, was presented to the Subcommittee in June 1978. See: D. D. Smith, Multipurpose Space Platforms: Institutional Alternatives, pp. 12–18.

What may not be quite so apparent is that there has been almost no inquiry into the nature of the institutional relationships, both domestic and international, which could be involved in operational large space structures and platforms designed for space applications. This lack of inquiry is extremely unfortunate because it substantially hinders progress towards implementation and the development of feasibility studies and preliminary plans for large space structures. A fundamental recommendation to the Subcommittee therefore, is that there is a need for direction with regard to the institutional relationships associated with space platforms and that the Subcommittee could provide this leadership.

In my remarks at our panel session during June of last year I indicated that one solution to the problem of overcrowding in the geostationary arc was to utilize large multipurpose space platforms which also have the benefits of providing for economies of scale and an increase in services. Further I stated:

"While the choice of technical design is important, until institutional arrangements are made there are likely to be few commitments by users. Without adequate user support the resulting insufficient funds will halt technical progress. Thus, priority must be given to resolving which institutional arrangements will best serve technical development." [3]

The question, then, is how to proceed to find the directions and routes that will lead to an optimum system that will maximize benefits to users.

The balance of the comments contained herein are offered with reference to the types of institutional considerations and directions which could be considered by the Subcommittee as part of its legislative leadership role. While emphasis is placed on international cooperation with space stations, the primary concern is with the domestic institutional structure because the United States, by virtue of its advanced position in the development of outer space and the STS, will probably be the first country to implement a large space structure.[4]

The United States now has a significant level of private sector involvement in numerous space applications and this involvement complicates the institutional planning process and makes it necessary to formulate configurations which take into account both public and private interests. Since in the future it will be desirable to foster an expanded role for the private sector in space industrialization, a great deal of consideration needs to be given to how the wide variety of interests can be assimilated into space station designs. This has posed a major barrier to the technological planners who are currently attempting to create preliminary designs and feasibility studies. Such activities involve institutional assumptions for factors such as traffic patterns and operational transitions from satellites to space stations. Several large space structure studies have been based on institutional assumptions which may or may not represent likely or even viable institutional configurations. Thus, Subcommittee leadership in the investigation and selection of domestic institutional alternatives for space stations could not only aid technological planners, but could hasten the development of space stations and the subsequent benefits from the expanded utilization of outer space.

I. TIMELINESS

Consideration of the institutional questions cannot wait. While the advantages of space platforms in providing permanent stations in outer space for the conduct of space applications ranging from remote sensing to materials processing is generally known, in one particular application area, satellite communications, implementation of space stations is necessary to provide specific advantages that will be needed in the near term. Among these are advantages in terms of alleviating geostationary orbital arc congestion, reducing costs through economies of scale and providing advanced telecommunications and teleservices.

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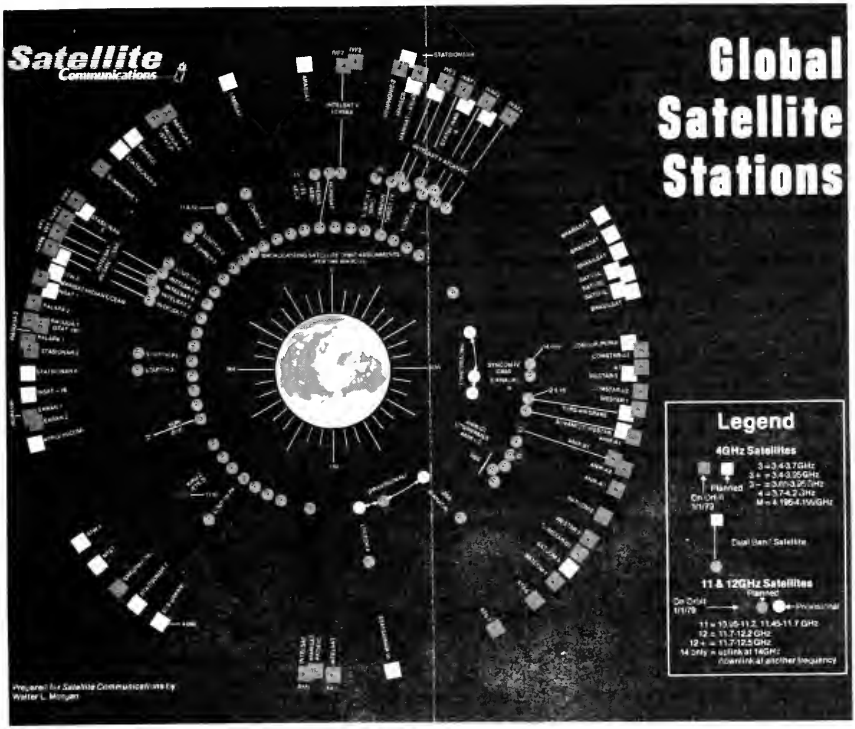
[3] International Space Activities, Report Prepared by the Subcommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, 95th Congress, 2d session. November 1977, p. 42.

[4] Walter L. Morgan, "Global Satellite Stations," Satellite Communications (February 1979), pp. 36–37.



A. Orbital arc congestion

Orbital arc congestion can serve as one example of this urgency. The fact that geostationary orbit crowding is a world-wide phenomenon is illustrated in Figure One. This figure depicts present and planned geostationary communications satellites. Indications are that saturation of the orbital arc in the 4/6 GHz frequency band (the outer ring) is nearly complete and the 11–12/14 GHz band (the center ring) is filling with applicants. The result of this congestion for the United States can be examined by assessing projected U.S. telecommunications traffic growth in terms of satellite transponder requirements. Although estimates for 1990 vary, ranging from a need for 450 transponders to 650 transponders, what is certain is that there is a rapidly accelerating traffic growth projection curve. The situation is further aggravated when international demands for orbital arc positions are considered. Space information stations represent a technological means by which the capacity of the orbital arc can be expanded. This is due to a station's capacity for increased radiated power, large antennas, and spot-beam techniques [5] which would allow a substantially higher transponder capacity. The conclusion is that orbital arc congestion alone is a strong driving factor leading towards the necessity of space information stations.

B. Teleservices

Of prime importance is the ability of space information stations to deliver teleservices.[6] This is the objective of the space information station and should deter-

[5] Walter L. Morgan and Burton I. Edelson, "The OAF Concept Extended," A Collection of Technical Papers, AIAA 7th Communications Satellite Systems Conference (San Diego, April 1978) p. 123.

[6] See D. D. Smith, Teleservices Via Satellite: Experiments and Future Perspectives (Slijthoff and Noordhoff, 1978).

mine not only the eventual technological configuration but also participation in and benefits to be derived from the system.

A new set of visions has begun to emerge that are based on the NASA decade of "user" experimentation on the ATS and CTS satellites from 1969 to 1979 which began on an ad hoc and somewhat serendiptous basis and continued through a period of gradual formalization. These "user experiments have explored and demonstrated the potential of space communications technology and societal purposes. Significant advances have been achieved in these areas and they have accomplished much more than the testing of a wide variety of possible applications. They have in fact, signaled the emergence of a new kind of activity which has been termed "teleservices." They have shown that space systems and the unique teleservices which they offer to mankind will make a difference in our lives.

During this experimental period, ideas were rampant, but those who took their ideas, created experiments, and saw them through to completion were few. The early experiments had an "amateur" quality about them in the positive British sense of the word. Hardware was adopted for a variety of purposes and concepts and systems were developed by chance as often as by design. Conceptual studies were undertaken with little knowledge of the effect they would have on a later demonstration program. Even legal and institutional issues were considered which turned out to have a significant effect on the institutional cycle of the space technology integration model and have radically affected the form of the operational space system of the 1970s.

What was missing was a comprehensive program for communication satellite development in speculative service areas. Generally, the early experimental community comprised a series of individuals and university-based groups who proposed and undertook experiments on an individualistic and separate basis. However, there was an undercurrent of optimism with regard to the potential of the communication satellite as a means of delivering worthwhile services.

It is to the lasting credit of NASA that throughout this early experimental period they continued—through the Office of Applications—to encourage and support a wide variety of experiments. However, the early experimental period is over and the experimentation of the 1980s will take place within the framework of space information stations. This optimism must be maintained during the 1980s.

There are lessons to be learned from the user experiments in terms of space application and institutional accommodations. It is obvious that there will be new experimentation but it will emphasize for some time to come improvements of, refinements of, and subtle variations in the basic experiments that have been completed. The basic experimental work has been done and the first chapter of the larger story of communicating via satellite has been written. The question remains as to whether we will be able to benefit from what we have learned and apply its basic principles and lessons to what we must do next. The experiments have provided us with guidelines as to how to structure institutions to provide for a comprehensive program of teleservices that can effectively respond to the technologic imperative of the 1980s. Thus the experiments can help us find a future perspective for the provision of teleservices.

There is an institutional cycle which for the past ten years has encompassed NASA experimentation and within which there is an experimentation imperative and a technologic imperative. As the process of space technology integration continues, decisions will need to be made as to the roles for the government and the private sector—the results of which will determine the form and substance of future space information stations.

Thus we need to learn from the experimental period how to structure future experiments and how to make a reality of "participatory technology." This, then, needs to be reflected in the institutional options that are being considered for space information stations. By considering these institutional options at an early stage, it is possible to combine a consideration of an experimental format together with the provision of operational services.

There will be new problems to consider during the 1980s with regard to teleservices delivery. The principle of rural telecommunications parity is one of these emerging issues. Communications technology occupies a particularly significant relationship to the general principle of parity in that it is a benefit that, since it is naturally more available to urban dwellers, can be provided to rural residents in order to produce parity; and it is also a means by which other urban benefits can be brought to rural residents in order to produce parity. Therefore it is a basic

tenet of the general principle of parity that the benefit of communications technology be made available to rural residents. Specifically, the principle of telecommunications parity holds that telecommunications technology and services which are generally available to urban residents should also be available to all rural residents on an equivalent basis in terms of quality and rates.

There may be parallels between rural telecommunications parity and the communications problems of developing nations that should be considered in experimentation on space information stations. Perhaps the unique communications problems of the Pacific basin should be given priority in future research and development efforts. In any event, the space system that is developed should be the beneficiary of the reasoned development of a balanced strategy that considers various opportunities.

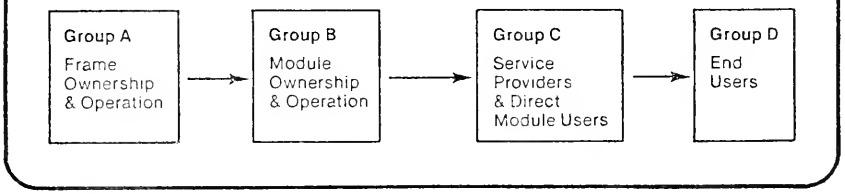
II. COMPONENT OWNERSHIP

During my research concerning the various institutional alternatives which are feasible and desirable for space information stations, it has become apparent that the component ownership concept is increasingly viable. In the United States, the fact that there are many private sector companies already involved in space communications precludes an institutional configuration in which the entire space station is owned and operated by a single entity whether such entity is governmental or private. Thus, an elaboration of the component ownership concept presented briefly during testimony over one year ago before this Subcommittee may be helpful.

A space information station will be composed of component parts, modules and systems, some of which could be distinguished for ownership purposes. The component ownership concept classifies the types of ownership into four categories or groups as depicted in Figure Two. A particular entity could be in one or more of the categories at a given time.

GROUP CLASSIFICATION SCHEME

Fig. 2



A. Group A

Group A involves ownership, operation, management, and maintenance of the station's frame together with those systems that are applicable to the entire space station, such as the power system, the tracking and control system, the interconnection systems, and other related systems. Group A may also involve ownership, operation, management, and maintenance of shared-component systems. For example, a large 30-meter antenna designed to be shared by several users could be owned by a Group A entity.

The Group A entity would lease space on board the station at a uniform and equitable rate to all Group B entities. Although a question may arise as to variable rates for what may be considered prime locations on the space station, such rates could be fairly and practically offered. Rates for shared-use systems could similarly be uniform and equitable and based on measurable units of utilization. The Group A entity would serve as a technical coordinator between all users of the platform and may possibly assume a role as broker of the Group B ownership rights.

B. Group B

Group B involves ownership, operation and, possibly, maintenance of individual components or systems on the station. These individual components or systems are referred to as modules, although various modules may be extremely different in terms of size and sophistication. A module may be a single trans-

ponder, a set of transponders and computerized switching equipment, or a large antenna and related equipment.

Group B entities could include a subsidiary of the Group A entity, one or more independent public or private corporations, or any of the Group C or Group D entities. The reason that a separate subsidiary would be required of a Group A entity for module ownership is to help protect against preferential treatment and cross-subsidization for the modules owned by the Group A entity vis-a-vis those belonging to others.

The Group B owners would lease module capacity to users either on a unit of measure basis or a proportion of module use basis. There would be no requirement that module capacity rates be uniform for several reasons. First, there would presumably be competition between module owners that would serve as an incentive to minimize the rates. Second, each module owner would be receiving space and services from the Group A entity at equal fixed and variable costs. Therefore, due to the use of a variety of modules of different sizes, sophistication, efficiency, and other variables, by the Group B owners, such differences would be reflected in rates charged by these owners. Finally, any Group C or D entity could become a Group B module owner if it so desired. Group B entities could also possibly engage in functions in addition to ownership and operation of modules, including module brokerage and module manufacture.

C. Group C

Group C entities would consist of service providers and direct module users. This category would include most of the present and planned operational space segment owners, including international and regional organizations. Public agencies or private corporations that operate domestic satellite communication systems would also be Group C entities.

Group C entities would have the option to be Group B owners if they desired to have direct ownership and control over their space-segment equipment. If these options were exercised, the Group C entities would be in a very similar situation to what they are today in that they would have complete ownership and control of their space-segment hardware. However, several of these entities may wish to lease their space-segment capacity from a Group B owner. In this way the Group C entity would economize in overhead costs while taking advantage of economic rates offered by the competing Group B owners. In addition, it may be possible for a Group B entity to own and operate a module that is significantly larger than what could be used by a single Group C entity, such as a larger antenna and related switching equipment. In this case, several Group C entities could avail themselves of the economies of scale inherent in such shared use without assuming total fixed costs for the module.

Group C entities that are service providers would provide their services on a rate basis. Similar to the Group B situation, there would be no requirement to equalize rates between the service providers. Rates would be different as a result of technical and operational efficiencies and capabilities of the service providers, just as it is with present-day satellite communications services.

The component ownership concept provides an institutional structure that allows existing operational entities from all nations, as well as international organizations, to continue to provide their services while each can avail itself of the favorable attributes of a space information station.

A Group C entity could operate systems that involved its own ownership of ground terminals, its customers' ownership of ground terminals, and/or interconnection between its space segment and those of a competitor for particular services.

D. Group D

Group D represents end users that include public agencies, private corporations or organizations, and individuals. Although Group D entities may have Group B or C ownership for a particular system, such as the case of a public-service satellite organization that may choose to operate a small module, or a corporation that chooses to operate its own in-house teleconference system, such occurrences would be atypical. Normally, Group D entities would provide the revenue base that would support the systems and entities involved with the space information station.

III. IMPLEMENTATION OF SPACE INFORMATION STATIONS

With an understanding that the timely implementation of space information stations is urgent, and that all existing entities could have a role, through the component ownership concept, in operational stations, the question becomes how the federal government could spur the development process. The essential technology to be developed relates to the station's frame and communications switch which would eventually be owned and operated by the Group A entity.

There are several alternatives for the composition of the entity which could serve as the Group A frame owner. It is possible for a federal agency to assume this responsibility. For example, as an extension of its space transportation involvement, NASA could be granted a mandate to maintain the space station frame. This would facilitate the experimental development and the operational transition of a space information station.

Alternatively, the Group A entity could be a private sector corporation or consortium of corporations. During last year's hearings, the private sector alternative for frame ownership was utilized in the "Americas Platform" institutional configuration which was intended for a regional geostationary multipurpose platform.[7] In that plan the platform corporation, referred to as Platco, would have been overseen by a federal regulatory agency to ensure that public needs would be met and international cooperation would be accomplished. The significant need today is not so much the identification of the types of institutional alternatives that could be selected, but rather a selection of an alternative so that implementation of at least the first space station could commence.

Subsequent to the Subcommittee hearings in June, 1978, an innovative institutional entity referred to as the Space Industrialization Corporation, was described in legislation introduced by Representative Fuqua (D–Fla.).[8] The concept of a federal corporation established in conjunction with a trust fund to administer and allocate federal funds for the purpose of encouraging and assisting space manufacturing by the private sector is very beneficial. The conversion of the federal corporation to a private corporation at such time as the enterprise is financially stable represents a unique plan that has many desirable attributes, not the least of which is a demonstration that operational systems publicly developed can effectively transition to the private sector.

While the institutional configuration of the Space Industrialization (SI) Corporation concept appears workable from the perspective of an appropriate configuration to promote, transfer and integrate technology within the private sector, it may be possible to expand its mandate to encompass space information stations. Although the corporation's mandate is subject to interpretation, it appeared that the SI Corporation was primarily intended to faciliate space manufacturing.[9] Thus, the urgency for creation of the SI Corporation is directly proportional to the urgency of implementing manufacturing processes in space. the implication being that to the extent space manufacturing is not seen as urgent, there will be a delay in the creation of this worthwhile entity.

However, if the mandate of the SI Corporation was expanded to include the encouragement and development of space information stations, there might be a significantly greater interest in early implementation of the SI Corporation concept. Space stations are a technological concept in need of an institutional configuration and the SI Corporation is a unique and viable institutional alternative in need of an urgent mandate. The linkage of these two concepts could be functional and desirable.

Specifically, the SI Corporation would facilitate a relationship with NASA (as contemplated in Sec. 102(k)), and private sector users such that the NASA developed large space structure technology could be combined with the modules, both experimental and operational, of participating private entities. In addition, the Group A ownership could reside in the SI Corporation or in a consortium which the SI Corporation would help form. In the context of the development and sharing of large space structure technology, space manufacturing could be encouraged as well.

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[7] Smith, supra note 2, pp. 31–32.
[8] Space Industrialization Act of 1978, 95th Congress, 2d session, H.R. 14297.
[9] 95th Congress, 2d session, H.R. 14297, Section 2(c)(11) and (12).

With the urgency and desirability for implementing space information stations and the fact that the SI Corporation concept has been discussed during previous hearings, it would seem possible to expand the SI Corporation concept. This would serve to clarify the institutional questions associated with space stations. The private sector entities already involved in space, and those that may become involved in the future, would benefit by the adoption of the component ownership concept and the development of a space station frame by the SI Corporation.

IV. INTERNATIONAL INVOLVEMENT

The implementation of space information stations represents a signlficant opportunity for all nations to enjoy greater benefits from space applications. During the hearings this past June an institutional model was presented which could be used as the basis for an operational ownership configuration. Of primary significance is the fact that the model was regional in nature. The regional organization was chosen to emphasize the fact that the nature of space information stations was not global, but rather hemispheric and that space programs do not have to be global in scope in order to be labeled "international."

The model, referred to as the Americas Platform, was designed to ensure cooperation among the many nations in the hemisphere while at the same time vesting ownership of the Platform in the nation which constructed it. An intricate infrastructure of organizations was described for the model which are still as viable now as they were then.

However, there are alternate approaches to international utilization of space information stations. The component ownership concept itself could provide a means by which foreign governments, entities or organizations could become Group B, C, or D entities. Such organizations may even participate in Group A ownership through methods established by the SI Corporation.

The question of control is important to foreign entities that would participate in, utilize and depend on a U.S. owned facility in space. The perception of a lack of control may be a cause for inhibitions in the cooperation among the nations and could result in possible disputes over limited geostationary orbital arc resources needed for space stations. The concern over control has its basis in a concern for access to the space facility and the continuity of space services which utilize the station. Thus, if a system of international guarantees of access could be developed, the need for an extensive and rather complicated set of institutional configurations, such as those associated with the Americas Plaform model, may be unnecessary.

The concept of "beneficial use" of space stations involves a set of international norms which could serve to assure access and continuity to foreign entities which utilize a U.S. owned space information station. In the future other nations could develop the capability to construct their own space stations, and thus these norms would become reciprocal. Universal adoption of such norms would allow those nations with the capability to construct space stations to do so and thereby become Group A owners. Other nations could be assured of receiving the benefits from the stations upon terms and conditions uniformly applied to all entities that utilize the station in similar capacities, such as Group B owners.

Such norms, if established through custom or agreement, would serve as a basis to assure equitable distribution of benefits of space stations to all nations under the component ownership concept. Six salient general norms are considered.

A primary norm would provide for and encourage any capable nation or nations to own and operate a space station as a Group A entity. Most nations presumably could not construct their own station. If such nations are to receive benefits, space facilities must be made available by those nations capable of providing them.

A second norm is that of resource priority for space stations, since these structures promise service capability for a vastly greater number of users than conventional satellites. For example, orbital priority should be granted to space information stations over single-purpose communications satellites. In addition, spectrum priorities should be acknowledged for space information stations by such bodies as the International Telecommunications Union.

Another essential norm is that of the right of participation of each nation as a Group B, C, or D entity. Further, various nations could participate in one or more of these groups at the same time. National participation could be through one or more government agencies or through one or more private sector entities.

A fourth norm involves the assurance that rates, services, and related matters would be available to all Group B entities on an equivalent basis. It would be necessary to create a detailed body of rules, standards, and regulations as a guide to the establishment of this norm. This would include rates based on an equitable apportionment of fixed and variable costs by the Group A entity or entities. A part of this norm would be the requirement that the rates have a relationship to the cost of providing services.

A fifth norm would require that service policies be established that would ensure to all nations in a region that competitive modules and/or services would be available to each nation. This may have to be accomplished through financial assistance programs designed to provide services to those nations that may have difficulty dedicating sufficient capital or assuring sufficient utilization to encourage provision of services that may otherwise not be available.

Finally, a system designed to encourage the optimal level of modules placed on a platform should be developed. For example, it may only be economically justifiable for several nations to be Group D entities, although for reasons of national security, prestige, concern over reliability, assurance of service continuity, and technological trade secret safeguards, such nations may wish to be Group B or C entities. Although this is their right under the third norm, and this right should be effectuated under the fifth norm, it can be anticipated that exercise of this right by a large number of nations may cause a proliferation of modules, the result of which would be wasted module capacity, inefficiency, and higher rates and costs. Therefore, the system should be designed to review and encourage an optimal level of shared use, and nations could voluntarily follow recommendations generated by the system.

V. CONCLUSION

As stated earlier, while the technological barriers can be overcome relatively quickly, the institutional questions pose a substantial barrier to the implementation of space stations.[10] It will continue to pose a substantial barrier unless leadership is shown in providing direction for the institutional forms that will be used in the initial space information station development.

The component ownership concept, together with the suggested international norms, would provide a basis for the entities and nations which are already involved in space activities to continue to do so while taking advantage of the beneficial attributes of space information stations. In addition, enlarging the mandate of the Space Industrialization Corporation to provide a focal point for analyzing and promoting definite institutional plans will greatly aid in the timely domestic development of space information stations and provide the opportunity for international cooperation in such stations as well.

STATEMENT OF DR. DELBERT D. SMITH, ATTORNEY AT LAW

Dr. SMITH. Thank you very much, Mr. Chairman.

Mr. Chairman and members of the subcommittee, I would like to summarize my remarks and have the full statement submitted.

I would like to thank you very much, for the opportunity to appear before you this afternoon to discuss the domestic and international utilization of large space structures. I am very much concerned with directions and routes with regard to the implementation of teleservices from space stations; the services that can be provided with technology that will benefit the people.

In particular, I am concerned with the need to consider the institutional arrangements that will be necessary to allow us to reach the destination of an operational space station that will have benefit to U.S. citizens. This, together with a determination of the core teleservices to be provided are issues basic to the process of space technology integration.

[10] See D. D. Smith, Space Stations: International Law and Policy (Westview Press, 1979).

It seems to me that there is a great concern over the technological capability to develop a space information station or a large space structure, but very little research into the nature of the institutional relationships, both domestic and international, which could be involved in operation of large space structures and platforms designed specifically for space applications. I feel that this lack of inquiry is extremely unfortunate because it substantially hinders progress toward the implementation of large space structures.

Therefore, let me begin with a personal recommendation to the subcommittee; there is a need for further direction with regard to the institutional relationships associated with space platforms and it is possible that the subcommittee could provide this leadership.

In my remarks at our panel session during June of last year I indicated that one solution to the problem of overcrowding in the geostationary arc was to utilize large multipurpose space platforms which also have the benefit of providing for economies of scale and an increase in services.

Further, I stated:

> While the choice of technical design is important, until institutional arrangements are made, there are likely to be few commitments by users. Without adequate user support the resulting insufficient funds will halt technical progress. Thus, priority must be given to resolving which institutional arrangements will best serve technical development.

The question, then, is how to proceed to find the directions and routes. What do we do now? What do we do during 1980, and what can we do to deal with institutional questions?

It seems to me that the major issue is one of timeliness. Without repeating the statements I made last year about orbital arc congestion, it is apparent that at the GWARC there is a serious question of orbital arc congestion. When one considers projections for transponder usage into the year 1990 which range from 450 to 650 equivalent C band transponder, it is obvious that there is going to be a problem that may only be able to be met by some form of large platform or large space information station.

Even more important than solving this serious and basic problem is the need to consider what teleservices could be delivered from such a structure that would go beyond basic communications services and would build on the decade of NASA experimentation on the ATS and CTS satellite from 1969 to 1979. While these experiment began in a serendipitous way, and many of them had a very delightful British amateur quality about them, we never saw the development of a comprehensive program.

We have a chance, I believe, during the 1980's to see the development of a comprehensive experimental program that could use the space information station as one of the basic technological tools to provide a variety of new, innovative, and desirable teleservices to people.

I think it is to the lasting credit of NASA that during this decade of experimentation, the Office of Applications continued experiment support in the face of many difficulties and problems; not the least of which was trying to find a way to fit the experimental program into a larger program that would have the kinds of results that would allow technology transfer to take place from the governmental and experimental area to the private sector.

I think one of the key questions during the experimental decade was the institutional question of determining the eventual role for the Government and the private sector. During the coming decade I would not like to see many of the institutional questions solved by default. I think it is possible to do advance planning, and with the availability of the technical resources for large space structures, this could be done in a very comprehensive and logical way.

The development of space information stations will give us new opportunities for experimentation. We are beginning to see the development of new telecommunications issues that I feel are very significant and have not been dealt with to the extent that they could be in conjunction with the development of a large space structure program. Of primary importance is the concept of rural telecommunications parity. We have begun to hear in many quarters that basic and expanded telecommunications services should be available to rural residents on the basis of equivalent quality and rates with urban residents. One of the ways to accomplish this would be through experimentation on large space structures, since it would be possible to get to basically thin route areas and the rural parts of our country in a cost-effective and technologically desirable way.

In addition, we have seen concern for developing countries and the potential for satellite experimentation. It would be possible through a concept of large space structures to provide for experimentation and eventually operational services for developing countries and widely dispersed geographic areas. One example of such an area is the Pacific basin. At the present time there is much concern in the Pacific basin over the development of a regional satellite system and the formation of a Pacific Telecommunications Council.

While it is easy to talk about the potential for teleservice delivery via a space station, when you get to the point of actual operation, these are difficult questions of ownership, management, and control. I think that one way to deal with the institutional problems of space information stations is to separate out platform ownership from module ownership, management and control and to do this by means of a component ownership concept. For purposes of discussion and debate, I have divided these ownership component sections into four groups: A, B, C, and D.

It seems to me that by developing institutional arrangements for each group rather than trying to deal with the space information station as a whole, it would be possible to rationally consider various institutional options in a near-term situation.

Group A I have configured as the organization, either public or private, that would be involved in frame ownership and operation. Group A would be involved with the shared systems, with power supplies, with the structure itself. I believe you will find that the private sector corporations and governmental entities that are concerned with frame ownership will be quite different from those that are concerned with module ownership and control.

Group B I have designated as the group concerned with ownership of the components. I suspect that there is going to be within the private sector a differentiation between those companies in group B who would be interested in owning components and then leasing modules to users on a whole or partial basis for use in the delivery of teleservices or

communications services and those in group C that would be the service providers and the direct module users. I think we will see the development of a wide variety of leasing arrangements with group B and group C component owners.

Finally, group D comprises the end users, but is actually a new category of end user because with the large platform and the ability for a large number of modules to be put onto the platform, we will see a wide variety of small users who will lease parts of a module and will provide innovative and creative telecommunications services. Examples of these include services to rural areas, to developing countries, or to other smaller segments of the communications market in a way that is not possible now, since involvement with single purpose satellites means committing many millions of dollars to a launch and maintenance of the satellite.

In terms of implementation and institutional options for large space structures for the platform ownership itself, I see an immediate role for NASA in the development of an experimental platform, together with the involvement of private sector companies, or possibly a consortium of private sector companies. In fact, in one of the institutional plans that has been developed, a suggestion has been made that a regional system could be developed involving a U.S. Domestic Platform Corporation with participation in module ownership by foreign entities.

One of the interesting ways that the institutional issues with regard to large space structures could be considered is through a suggestion that I am making toward an enlargement of the Space Industrialization Corporation. At this point this is just an idea that might work within the context of the space industrialization bill. It seems to me that within the basic concept as it has been developed, it would be possible to expand the mandate of the Space Industrialization Corporation so that it could be given a near-term mandate to become involved with the development of a space information station.

It is my thought that this involvement would come well before materials processing and some of the other space applications and would allow us to solve one of the difficult institutional questions we are facing. On the one hand, we have NASA, and on the other hand, we have the private sector, who are also beginning to study space information platforms. Some one, some group, some entity could bring them together in a joint venture activity, and in the process create the circumstances where there can be cooperation rather than confrontation between the public and the private sectors.

It seems to me that the time frame for this activity is early in the 1980's and, therefore, would be one of the activities that could be undertaken by the Space Industrialization Corporation in the near term that would benefit both the development of platforms, and possibly provide an early base for the Space Industrialization Corporation itself.

One of the issues that we discussed during the hearings last June that is still with us in the case of large space structures is the issue of international involvement. I feel very strongly that platform ownership and control of a regional or a domestic platform should reside within the United States. I feel that the component concept would allow foreign participants to become involved as group b, c, or d

entities. This would require establishing an international guarantee of access, but I think this could be done. The basis for this international guarantee of access ought to be the concept of beneficial use.

It is not really necessary for every nation to own a platform. What is important is that they have access to a space service that can provide teleservices. In that context I have set forth six international norms, the goal of which would be to assure access and continuity to foreign entities that would become involved with and utilize U.S.-owned platforms.

The first norm would be to encourage group a ownership if possible, but more important to encourage beneficial usage of large space structures and space facilities. The second norm would provide orbital priority for space information stations over single purpose satellites. The third norm would create a right of participation for foreign entities as group b, c, or d participants. The fourth norm would create an assurance of rates and services and make the services available to all group b entities on an equivalent basis. The fifth norm would provide competitive modules and/or services and make them available to each nation or region and, if necessary, would provide for appropriate financial aid programs through the appropriate domestic and international entities. The sixth norm would provide a system that would be designed to review and encourage an optimal level of shared use.

In conclusion, I feel very strongly that while technological barriers can be overcome relatively quickly, it is going to be the institutional questions, both domestic and international, that will pose a substantial barrier to the implementation of space stations. It will continue to pose a substantial barrier unless leadership is shown in providing direction for the institutional forms that will be used in initial space information station development.

The component ownership concept that I have briefly outlined together with the suggested international norms would provide such a basis for the entities and nations that are already involved in space activities to continue to be involved, while taking advantage of the beneficial attributes of space information stations.

In addition, enlarging the mandate of the Space Industrialization Corporation to provide a focal point for analyzing and promoting definite institutional plans will greatly aid in the timely domestic development of space information stations and provide the opportunity for international cooperation in the use of such stations, as well.

Thank you very much.

Mr. FUQUA. Thank you very much. We appreciate your very informative and enlightening comments about some areas of interest that we certainly have.

I would like to invite the previous witnesses to join Dr. Smith at the table. We do have some questions.

Dr. Edelson, you mentioned that some of the technical and institutional problems will have to be solved before the implementation of an orbital antenna farm. Could you elaborate on that?

Dr. EDELSON. Yes, Mr. Chairman. I would be glad to.

I think there are at least two types of technical problems involved with the platform itself. One would be the problems of mounting multiple missions and payloads on a platform, the interference of one payload with another, the incorporation of different missions on the same

antenna system, and the ability to provide the necessary stabilization and other housekeeping functions.

Those are the kinds of problems that space technologists and engineers can solve. Some are quite difficult problems of radio frequency interference, one mission with another or one band of frequency with another, problems of very precise stabilization and pointing of antenna systems and so on. But those problems are amenable to engineering solutions.

There is another technical problem involved in the assembly and control of very large structures in space which requires development work. We simply have not had previously the experience in building structures in space, assembling beams, erecting very large antenna systems, providing and distributing power and solving the rather interesting problem of thermal distortion of very large structures. NASA has a number of development projects underway in this area, particularly at the Huntsville Center.

There are, as I mentioned, several good projects and no obvious technical barriers to success. I think they will be solved through the 1980's by the process of engineers with experience working together with the systems.

The institutional problems I can do no more than identify. Del Smith, I think, has addressed them in some detail. I identify them simply as problems involving the ownership and operation of the platforms, who owns them and who pays for them, who operates them, who receives the profits from the operation or bears the loss for their lack of performance, if that is the case.

I am not qualified or eager to address those problems myself, but I am sure Del Smith is both eager and willing.

I did mention a problem that I think does deserve the attention of this committee, and that is the problems having to do with the programing and scheduling of launch vehicles. If we are ever to have geostationary platforms, we must have the capability of placing them in orbit, and the Shuttle program, though somewhat behind schedule today, eventually will be able to place platforms in low Earth orbit. We do not yet have a good capability, nor do we have a planned program in our space technology arsenal for lifting deployed, large systems from low Earth orbit, a few hundred kilometers, to the geostationary orbit which is 35,800 kilometers and orienting, pointing and maintaining the platform in orbit for very long periods of time, two decades or even longer. I would like to see NASA undertake a development program leading to the capabilities to make operational use of these platforms feasible in the 1990's.

Mr. Fuppo. Thank you very much.

Do you believe the present NASA efforts in the development of an OTV are adequate?

Dr. Edelson. I think they are not adequate. You are talking about an orbital transfer vehicle, and that is essentially what I was speaking of when I mentioned raising from the low Earth orbit, which the specialists familiarly call "LEO." So what you need is a LEO to GEO capability.

We do not have an adequate orbital transfer vehicle, OTV, today. You may have heard of what is known as "SSUS–A" and one called "SSUS–D." These are spinning upper stages which are ap-

proximately equivalent, respectively, to the Atlas-Centaur and Thor-Delta. These two stages, SSUS–A and SSUS–D.

They are equivalent to the Atlas-Centaur and the Thor-Delta and they are known as the A and D, and they are approximately equivalent to those, and in no way capable of placing a large body stabilized spacecraft in geostationary orbit.

There is the so-called IUS or inertial upper stage which is a solid propellant unit under development by the Air Force, which simply is not adequate in weight capability. It is much too rough a ride as the solid propellant normally gives. It is too high a G loading to provide an adequate launch into geo-orbit. So we need something else, and something such as the Centaur upper stage launched from the Shuttle which would be capable of putting up a reasonable payload, 4,000 kilograms or so.

Mr. FLIPPO. Thank you.

Mr. Stofan, in June of 1978 this committee held a panel on international space activities, and the panel made some recommendations regarding cost reductions for an international space activity. Are you familiar with any of the recommendations and, if so, do you think any of them would be effective in reducing costs?

Mr. STOFAN. I am familiar with the recommendations. As I mentioned earlier in the testimony, we are taking another look at ways to make Spacelab more economical. I think one of the points brought up before was the degree of integration of the instruments into the Spacelab through the use of central computers. The mission management aspects and the analytical and integration activities for this approach have become so complex that they are time consuming and costly.

We are taking another look at the Spacelab concept to see if we can provide much more autonomy for the experiments so they are simple and have plug in and out type interfaces, and not so totally integrated which would be a much more economical way to go. We are just starting a study to see what we can do to make it a more economical operation.

Mr. FLIPPO. Dr. Smith, what are some of the various alternative proposals for the development and the ownership of multipurpose platforms?

Dr. SMITH. One of the major decisions that has to be made as one considers the development of a large space platform is the extent to which, once you separate ownership of the plaform from use of the modules, provision will be made for foreign participation. There are a number of institutional forms that could be used. It is possible, of course, to configure the platform purely as a U.S. domestic platform and, if there was excess capacity, to allow others to use it at the owners discretion.

Second, a regional or hemispheric platform could be developed where at the outset, with regard to the platform itself and the modules, there would be an informal or formal relationship with other governments, possibly with their financial participation as well. Then the result would be a platform which would be shared within an entire hemisphere. Following the establishment of the initial platform two, three or even four platforms could be established with different institutional bases for each one. There could be a Government platform,

which would be completely or almost completely experimental in nature, or it could be involved both with experimental and operational services, or any variation thereof. Domestic satellite companies could be involved in platform operation as well as telephone companies, CATV concerns, or broadcasting entities. Because there are so many institutional options, I feel consideration ought to be given to their attempted resolution now rather than by default after the technology is established.

Mr. FLIPPO. Could you discuss some of the legal questions both domestic and international of the operation?

Dr. SMITH. There are a number of specific legal issues that arise if a platform is primarily owned and operated by the United States. There will, of course, be questions of access by foreign entities and issues concerning guarantees of access. In addition there will be debate as to whether or not some form of international agreement would be necessary to guarantee a right of access.

There will be issues of privacy that will arise pertaining to the various communications uses to which you put a platform. There will also be specific problems of military security for large space structures. This problem area was discussed a year ago, in fact, when we discussed some of the specific international legal questions that would arise with regard to protection of such a platform.

There are at least seven or eight additional problems that are not solely related to a platform that will be magnified by large space platforms, but are also present as a part of satellite communications law and policy at the present time.

Mr. FUQUA. Del, on page 2 down at the bottom you mention the fundamental recommendations of this subcommittee as their need for direction with regard to institutional relationships associated with space platforms. Could you elaborate on that portion?

I realize some of this may duplicate some questions that have already been asked, but it is certainly on the minds of the members.

Dr. SMITH. I used the phrase that there is a need for direction which the subcommittee could provide since I feel very strongly that there is an appropriate congressional role in the development of space technology; specifically when you deal with institutional issues. The history of the communications satellite and Earth resources satellite area has indicated that many times the institutional issues are not considered until well after the technology has reached an operational stage. Thus, it seems to me that a forum should be provided for immediate discussion of the institutional issues. Whether or not this is done by extending the mandate of the Space Industrialization Corp., or by some other means I would not presume to say.

I simply felt that the call for direction and the substantive argument that the direction ought to be provided now is important enough and basic enough to put at the outset of my testimony. The technique or the implementing procedures would be the ones that you would specifically choose.

Mr. FUQUA. What type of framework and institutional and managerial arrangements are necessary?

Dr. SMITH. One of the major threshold questions is to decide the role for the Federal Government and the private sector. In a way, it is the same kind of problem that was faced in the Earth resources and

meteorological areas and to some extent similar to the one that was faced at an earlier time with regard to the whole communications question. It is possible that through the development of an experimental platform there would be such a large Federal presence that it would be difficult to ever have a technology transfer or applications transfer to the private sector.

If what we are looking for in the 1980's is the possibility for joint ventures between the public and private sectors, I think that possibility needs to be considered at the outset.

Mr. FUQUA. How can NASA, which would probably be the agency involved, better incorporate these institutional and management arrangements in their future studies of space information systems?

Dr. SMITH. In many numbers of ways. It is my personal opinion that, within their management structure, NASA could consider institutional questions. Whether they did it through their General Counsel's Office or whether they did it through any one of a number of institutional units within NASA, the goal would be to have them focus on the institutional and organizational questions rather than the specific technical questions. The ability to do that would either have to come from an external mandate or from an internal new direction, and that, of course, would be subject to the various constraints NASA has in terms of budget, funding, et cetera. I would defer for the rest of that answer to the NASA representative because I would not presume to speak to how they could specifically accomplish their objective. However, it seems to me the current mandate under the Space Act is certainly broad enough to accomplish the objective.

Mr. STOFAN. I would have to defer that question to Neil Hosenball, who will be with you tomorrow afternoon.

Mr. FUQUA. Mr. Winn?

Mr. WINN. Thank you, Mr. Chairman.

Dr. Smith, you discussed the principle of telecommunications parity which says that comparable service and rates should be available to both urban and rural residents. I wonder who subscribes to this principle, or are you saying that it is a principle that should be subscribed to?

Dr. SMITH. I believe it is a principle that should be subscribed to. I am aware of the principle in a slightly different context, and that is with regard to the small rural telephone company, and the issues that they are facing as consideration is given to the question of whether or not broadband services can be provided to rural areas. It is one thing to say that a rural area can only have basic telephone service, but not cable television and other services. It is quite another thing to say that there ought to be parity between the services that are provided to urban and rural areas since they use frequency space which is a national resource. The advantage of the satellite and the large space platform is that television can be provided to both areas.

But, again, the institutional threshold has to be passed before you get to the technological delivery of the service. You have to decide who is going to provide it. Are telephone companies going to provide it? Are cable television companies going to provide it? Rather than separate that discussion from a discussion of platforms I think the issue of management and control ought to be researched in parallel with the technological development.

Mr. WINN. On the first page of your testimony, you comment on an operational space station. I am a little confused. Do you consider a space platform a space station?

Dr. SMITH. I do.

Mr. WINN. How do you define space station?

Dr. SMITH. I started out calling them large space structures, and found that there were many reasons why that was not necessarily the most desirable phrase to use. Then I began to call them space platforms and I was reminded by my technical friends that they were not really platforms either. They were more than that. So I began in the writing I have done to call them space stations. The basic definition of space stations is that they are constructed in space.

We are getting very close to space platforms, and I think Dr. Edelson might want to comment in terms of Intelsat V and whether or not as multipurpose satellites are developed you are coming close to platforms. I would consider that while Intelsat V may be considered a basic form of platform, the kinds of platforms I envision involve communications, meteorology and Earth resources all on one constructed platform; whether they are manned or unmanned is another issue, but they have to be constructed in space to fit the definition.

Mr. WINN. Would you care to comment on that?

Mr. EDELSON. I agree with that.

Mr. WINN. I would like to ask you, Dr. Edelson, along these same lines of questioning that Chairman Fuqua asked: Do you envision Intelsat acting as the institution which implements concepts such as space platforms, or will it require a separate institution? What's your version?

Dr. EDELSON. In answer to your question, I know that Intelsat has expressed an interest in implementing the space geostationary platform concept. Dr. Santiago Astrain in his testimony before this subcommittee a year ago stated that they would like to be instrumental in implementing and play a role in operating geostationary platforms.

In the terminology used by Del Smith, I think that it would make them category B participants. I feel a little ill at ease using this terminology and trying to work my way into the institutional arrangements, but I would think that Intelsat would be interested in and might very well serve as an agent or broker to handle service. They would put on a geostationary platform the modules and components necessary to provide the international service for which they are responsible, and then might lease out as they now do some of that capacity for domestic operators and so on, who would be the category C operators that Del was talking about.

I am not sure I have the categories right, but in the Intelsat context the earth station owners and operators for example Comsat in the United States and the British Post Office in the United Kingdom, those people would fit into category D following Del's categorization.

Mr. WINN. I think that helps clarify it. I have one more question, Mr. Chairman, and then I will relinquish my time. This question is of Mr. Stofan.

The date for the first Spacelab flight has been delayed substantially, almost a year, and the payload specialists that were brought onboard some time ago for training concern me. What are they going to do with all of that extra time, and what is going to be the cost impact of this delay on the training costs of the whole program?

Mr. STOFAN. Spacelabs 1 and 2 have been delayed. Spacelab 1 has been delayed about 18 months and Spacelab 2 about 16 months. The cost impact for Spacelab 1 and 2 delays for the training, for carrying the experimenters for a longer period of time, has caused a funding increase of approximately $11 million in fiscal year 1981. That includes the experiments, the experimenters, their development time, and also the training of the payload specialists, and again, the same group of people is going on with more detailed training.

It is costing us more. If you want a further breakdown, I would have to get it.

Mr. WINN. I would appreciate it because I really cannot visualize what additional training they would do. I could see them spinning on for another 3 or 4 months maybe, but for the additional time of up to a year, I do not know what they are going to do. If you could give me a breakdown on what additional training they are going to do.

Mr. STOFAN. I will provide that.

Mr. WINN. And a cost breakdown.

Mr. STOFAN. Yes.

Mr. FUQUA. Dr. Edelson, you have indicated that NASA should begin to define and develop a geostationary space platform. What type of funding are you talking about for fiscal year 1981 or the following years?

Dr. EDELSON. That is a difficult question for me to answer, Mr. Chairman. NASA is embarked on a set of design studies through their Huntsville center to define a geostationary platform, consider candidate missions and come up with one or several possible designs which could be launched from the Shuttle with a single upper stage or with multiple upper stages.

In my statement I suggested that NASA might wish to push forward with a developmental model. It would be launched with one upper stage from low Earth orbit to geoorbit. NASA could define such a program in about 1 year at a cost of something like $1 million to $2 million. That is a complete design effort of the phased type that NASA normally goes through before they embark on a flight program.

The net result of that would be an RFP to industry to build such a platform. Now I am going to go around your question by saying that actually to build such a platform and mate with an upper stage and launch it would cost several tens of millions of dollars. I would be reluctant to put a closer number on it than that at the present time.

I am specifically talking about a flight program that could put a geostationary platform in orbit in about 1985.

Mr. FUQUA. What role is there for the private sector in the development and design of this program?

Dr. EDELSON. I think the aerospace manufacturing companies would very likely serve as design agents and would manufacture the platform to NASA specifications.

Mr. FUQUA. I am not talking about a contract for construction of it, but the planning definition, design, and development of the platform.

Dr. EDELSON. I am sorry, Mr. Chairman. Yes, since many of the potential users of the platform would be from the private sector and, indeed, not only from the United States but international and

foreign, a way should be found for them to participate in the mission analysis and definition.

I think that can well be done through a committee—I hate to recommend it—but committee action and aggregating the user requirements through studies and other marketing techniques.

Mr. FUQUA. Mr. Brown?

Mr. BROWN. Thank you.

Gentlemen, I confess that I am a neophyte in this area. I am more interested in just trying to further my own understanding of the complexities of this.

Mr. Stofan, I understand that either this year or in the next fiscal year NASA is reentering the communications R. & D. area that they had somewhat gotten out of in previous years. Am I correct in this?

Mr. STOFAN. Yes; that is correct.

Mr. BROWN. What is the nature of the work that they will be doing in this particular area? Does it involve geostationary platforms or what does it involve?

Mr. STOFAN. It involves long-range research and technology. We talked with people in Intelsat and Comsat on what role NASA should play in the future in the communications business, and it is long-range research and technology. The geosynchronous platforms are another area that NASA is looking at for future potential use.

Mr. BROWN. But that is not considered to be part of the communications R. & D. per se?

Mr. STOFAN. No; it is large space structures and is being looked at by a different group, although the communications group is part of the large space platforms because that is one of the envisioned usages for the geosynchronous platform.

Mr. BROWN. The geosynchronous communications satellites that we now have in operation are not called platforms. Those are just geosynchronous communications satellites.

Mr. STOFAN. That is right. We call them satellites, and I guess there is a difficulty here because there is a subtle distinction between a free flyer like a satellite and a platform, and what is the difference between the two? I guess we kind of look at it if it goes up in the Shuttle and can be tended by man, it is called a platform, and otherwise it is a satellite.

Mr. BROWN. Do we make some subtle distinction like being assembled in space instead of launched complete as a package?

Mr. STOFAN. No.

Mr. BROWN. All right.

In connection with the communications research, the long-range research that you say NASA is authorized and has money to do again, does that involve any of these concepts of institutional arrangements which Dr. Smith referred to? You are not into the institutional research end at all?

Mr. STOFAN. No; it is the basic technology that is needed in the communications, not the institutional arrangements.

Mr. BROWN. In some areas that I am acquainted with research on institutions is considered a subset of other kinds of technologies. In other words, new kinds of institutions are considered social technologies. You do not look at it that way in NASA?

Mr. STOFAN. No, NASA is not in the social technology business.

Mr. BROWN. That poses an interesting problem. I happen to agree with Dr. Smith, as far as I understand him, that the major obstacles in the next generation are institutional. If NASA does not feel it has a mandate to explore institutional arrangements and if Comsat has a problem in this area for various reasons, who does the institutional R. & D. that is necessary in connection with this new frontier of space that we are talking about? Is that left to happenstance, you might say?

I am thinking of some very specific problems. We have the WARC Conference coming up in the very near future and there is going to be a little tugging and hauling over spectrum allocations and geostationary orbit allocations and the solution to some of these problems might be at least the unfolding of some new institutional arrangements that would satisfy the group of 77 nations. For example, who cannot vote with us in the United Nations or in WARC? And, I am puzzled to know who is going to do the idea development and presentation that might get us over this hurdle.

From what I am told or read, this WARC Conference has the possibility of making allocations that may last for another 15 or 20 years, and the technology is going to be way ahead of what we can come up with in terms of arrangements next month.

Mr. STOFAN. I think in the past it has evolved rather than being planned in the beginning. I would defer to Del on that.

Mr. BROWN. Dr. Smith, would you care to help enlighten me a little bit in this area?

Dr. SMITH. I think you have keyed in on the most important question, not only for the 1980's but also for the year 2000. The direct response in terms of the G/WARC question to those of us who have studied the ITU over the years, in that in its early years the ITU was strictly a technical organization, and the countries that came best prepared to discuss technical issues usually went away with what they wanted.

I think we are going to see a completely different political arena in Geneva during the present GWARC where issues such as the New World Information Order, are a very important part of the agenda. While I am not saying that we cannot solve international political problems, I am saying that the ITU itself has developed much more into an international, political organization than it has been in the past, and therefore, it is incumbent upon the United States, in my personal view, to deal as effectively as possible with questions that are both political and technical.

It seems to me that you have also clearly pointed out that when it comes to determining where institutional studies should be conducted—where technology assessment should be undertaken—that there is not a clearly defined location. The participatory technology discussions that take place in universities many times do not focus on the realities of the situation and the need for decisionmaking in the near term. However, technical, engineering and scientific groups many times avoid institutional issues because there are no clearcut solutions, and there may be the necessity for compromise.

I believe that it is possible to consider institutional issues within the framework of a space technology integration model. I have described this model in my book "Communication via Satellite" and one of its major premises is that one can deal with the institutional issues

at the same time the technology is developing. I am suggesting that it is necessary to find a forum in which discussions of institutional issues can take place, and the space technology integration model can be applied.

Mr. BROWN. The ITU votes on the basis of one nation, one vote.

Dr. SMITH. Yes; although many decisions are reached through consensus.

Mr. BROWN. So if the majority of the world's countries decided to vote to take the geostationary orbit slots and do something with them, they could do so and it would kind of leave us at a disadvantage. Is that right?

Dr. SMITH. It is always possible that decision of international entity could have that result. On the other hand, there is a very important sense of mutual cooperation present in these international discussions. If you want the system to work, there has to be a certain basic level of cooperation. A time may come when political pressures run so high, as they did in certain aspects of the Law of the Sea Convention Conferences, that basic cooperative tenets are forgotten.

I would hope that this would not occur at the G/WARC or at the 1982 Plenipotentiary Conference that is being planned by the ITU.

Mr. BROWN. You had some interesting comments in your statement about this business of equal rural participation. It led me to thinking of our own early experience with rural electrification and rural telephone communication, in which in order to offset a situation where it was not profitable for private companies to get into this field or to extend service in an area, the economics just did not justify it. The United States as a matter of policy encouraged the formation of rural electrification cooperatives and rural telephone cooperatives and provided them with certain incentives in the form of low-cost loans.

Did you have in mind or are you suggesting the possibility that something of this sort might be done in terms of space communications and, more specifically, could something of this sort be worked out to assist in meeting the needs of the less-developed countries, so they could trade off their rights to a piece of spectrum or an orbital slot for some additional assistance in technological development in the communications field to bring them up to scratch with the rest of the world of communications?

Dr. SMITH. The reason I stressed the concept of beneficial use within the context of developing countries is that I feel that a situation could develop where a developing country could obtain access to a domestic space communication system without necessarily having ownership of a satellite. If the objective is to benefit the people of a country and provide basic teleservices, including continuing education, rural health care, and related services, then participation in a space platform with an emphasis on beneficial use and access to the platform is what is significant.

A plan for providing access to a space station for developing countries could be formulated by USAID as a part of its communication program. Participation in a hemispheric or regional space platform could be a satisfactory way for services to be provided that would fit within the basic foreign policy interests of the United States.

There is also a parallel application of beneficial use to U.S. rural areas. My home State is Wisconsin, and we have a large number of

rural telephone companies. In a recent presentation to them, it became very clear to me that the early standard of basic telephone service, while it was appropriate for many years, may not be adequate during the 1980's. It may well be that broadband services, including education, rural medicine and business services, should be provided to rural areas on the same basis they are provided to urban areas.

There is only one effective way at present to do that and that is to utilize a space system that can deliver those services. It seems to me you have to go beyond the basic telephony standard to one which I choose to call rural telecommunication parity. If this becomes accepted as an appropriate standard, then eventually it will transition into a right to telecommunications parity, which I feel we should be very careful to protect.

Mr. BROWN. I am fascinated by this. It seems to me there are huge commercial opportunities here for various segments of the private enterprise in this scheme that you suggest. For example, if someone would assume the leadership role in solving these institutional problems, it would open up a whole panoply of opportunity as, for example, in the Chinese situation where the first piece of technology they seem to want to grab from us is a satellite communications system. I know from our experience with the site experiment in India and other similar situations that there are huge markets there for a global system of some sort, an institutional system to be put into place.

You are suggesting that this committee might have a role. I would be delighted if we could have some role in doing this, and yet I do not know where to put the pressure in order to say, "Look, this is the key element which we need to do something about. Let's get with it and do it."

I know that at our sister Committee on Commerce when they tried to rewrite the Communications Act, threw their hands up apparently, and that was a forum in which some of these problems could have been addressed, it seems to me.

Dr. Edelson, do you have some comments to help the committee develop a course of action that would solve some of these problems?

Dr. EDELSON. I am not sure I can say anything particularly helpful, Mr. Brown. I am generally very interested in the subject, and I agree with the comments that have been made by Andy and Del on this subject.

In my own statement and in answers to the questions, I have tried to point out that there are certain technical steps or development steps that should be taken if we are ever to have this capability.

Mr. BROWN. You are talking here about the technology of the geostationary platforms and launch vehicles and the rest of those kinds of things?

Dr. EDELSON. I was at that time, and I base that on the need and desire to provide ever more economical telecomunication services, among which are such things as direct broadcast to the homes that would go a long way to provide the educational entertainment and other video services that we may wish to have equalized across the Nation, but certain other services such as electronic mail and the advanced computer communications networks, electronic funds transfer systems, and industrywide systems that will help us get into the distributed computational age in which we are plunging.

Now, being from the private sector and a representative of a company that has been very successful in exploiting advanced technology for commercial purposes, it is quite clear that we and others would be delighted to employ the new technology to provide new, high quality, economic services of the type we have been discussing, when and if the capability is made available.

There are two questions I cannot answer: what kinds of institutional arrangements should be made and what the specific economics are. I am lost in that area.

Mr. BROWN. You have demonstrated the concept of the fact that you can lower costs as you have over the years, and that trend will probably continue with the services you are providing. Am I correct?

Dr. EDELSON. Yes, sir. I am proud to say that we have done a very good job in that.

Mr. BROWN. And you are getting into some additional lines of service. I understand you are into environmental monitoring fairly heavily now, and this is an area which possibly can be expanded. You are transmitting monitoring signals, water flow, and a lot of things like that through some of your satellites, and these can then be used by whatever user agencies are interested. You cannot get into Earth resource sensing, I presume, or other activities of that sort? Are you limited?

Dr. EDELSON. I do not believe that we are limited. I know internally we have studied the possibility for not only the telecommunications involved in Earth resource sensing, but in providing some role in the sensing itself. The reason we have not entered this field is it has not up to now proved to be commercially profitable.

Mr. BROWN. The market is not there?

Dr. EDELSON. That is right.

Mr. BROWN. But the market in some areas is developing quite rapidly. Like you have SBS coming along in competition, if I understand you correctively, Satellite Business Systems.

Dr. EDELSON. Yes, sir. COMSAT General a wholly owned subsidiary of COMSAT is a one-third owner of SBS.

Mr. BROWN. What about the services Western Union provides? Are they in competition with you or are they a customer of yours?

Dr. EDELSON. Western Union through the Westar System and RCA through SATCOM are domestic satellite communications carriers and are, to a certain extent, competitive in the business that SBS will address.

Mr. BROWN. I see. So SBS, in a sense, is sort of a partially owned subsidiary of COMSAT which is going basically into the data transmission business. Is that right?

Dr. EDELON. Yes. They are competitive with Western Union and RCA since they are in the domestic satellite communications market. However, SBS is addressing a particular share of that market.

Mr. BROWN. As I indicated to begin with, I think my questions indicate my ignorance of many of the details of this, and yet the point I am trying to get to is how we integrate these systems within an institutional framework that will allow their full development in the most expeditious and effective way, and I do not see the answer to that.

Dr. EDELSON. I would really have to take issue with the fact that you do not understand the problems in this area. The fact that you are posing these very excellent and precise questions indicates you have a

pretty good understanding of the subject. Your questions are, in fact, very difficult ones which many of us are groping with and have no really good answers for at the present time.

Mr. BROWN. Well, we are looking to you for answers.

Dr. Smith, I have not read any of your books, which is a great loss on my part. They are readily available from some friendly publisher, I presume, are they not?

Dr. SMITH. Yes. The first two books are available from the Sijthoff Press.

Mr. BROWN. How about the one coming out in October? Who is the publisher?

Dr. SMITH. That is Westview Press in Boulder, Colo.

Mr. BROWN. I would like to get a copy of that.

Are there any further questions? Do any of the staff have any further questions?

Mr. BROWN. Larry, do you have any questions?

Mr. WINN. No. I would just like to point out that this committee will meet again at 10 in the morning for additional witnesses, and we appreciate you gentlemen coming back. I think you can see the interest that the members of this subcommittee do have in this subject matter.

Mr. BROWN. Thank you very much.

The subcommittee will be adjourned.

[Whereupon, at 4:07 p.m., the subcommittee adjourned, to reconvene at 10 a.m., Thursday, September 6, 1979.]

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INTERNATIONAL SPACE ACTIVITIES, 1979

THURSDAY, SEPTEMBER 6, 1979

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:23 a.m., in room 2325, Rayburn House Office Building, Hon. Don Fuqua, chairman of the subcommittee, and Hon. Ronnie G. Flippo, acting chairman of the subcommittee, presiding.

Mr. FUQUA. The subcommittee will be in order.

We continue this morning our hearings on international space activities. The subcommittee will review the actions of international organizations and the effect of these actions on future space activities, as well as on the applications of space technology to the needs of the world.

The first witness is Mr. Glen Robinson, who is the chairman of the U.S. Delegation to the General World Administration Conference. The second witness will be Mr. Neil Hosenball, who is chairman of the U.S. Delegation to the United Nations Committee on the Peaceful Uses of Outer Space. Then we will hear from the Honorable John Breaux, Representative from Louisiana. We're happy to have Congressman Breaux appear this morning. He's had very extensive activities in our Law of the Sea Conference. Then we"ll hear from Mr. Leigh Ratiner, attorney representing the L5 Society, and after Mr. Ratiner we're pleased to have Mrs. Eilene Galloway, vice president of the International Institute of Space Law of the International Astronautical Federation.

We'll be happy to hear from you, Mr. Robinson, at this time, and I apologize for the delay.

[The prepared statement of Mr. Robinson follows:]

STATEMENT GLEN O. ROBINSON, CHAIRMAN, U.S. DELEGATION TO THE 1979 WORLD ADMINISTRATIVE RADIO CONFERENCE

Mr. Chairman, Members of the Subcommittee, I appreciate this opportunity to appear before you today to discuss the 1979 World Administrative Radio Conference (WARC) and its implications for international space activities.

Let me begin by saying a few general words about the Conference itself.

The WARC is an activity of the International Telecommunication Union (ITU), a 154-member specialized agency of the United Nations that promulgates the international radio regulations and other international standards for telecommunications, and generally promotes the improvement and rational use of telecommunications. The 1979 WARC, which convenes in Geneva on September 24, will review the allocation of radio frequencies throughout the world and make any modifications considered necessary. It will be the first general conference in twenty years with the power to consider all uses of the radio frequency spectrum

as well as related technical and procedural provisions. We anticipate that results of the 1979 WARC will influence the development and use of communication-electronic equipment and the pattern of national and international radiocommunications systems into the next century.

U.S. objectives at the 1979 WARC can be summarized very briefly as follows:

To begin with, we seek incremental changes in allocations and regulatory procedures tailored to changing technology and to new and changing social and economic needs. However, our proposals do not seek radical change in the overall structure of the ITU and its regulations. We have viewed with great skepticism claims by some that the ITU must be revolutionized and its regulations overhauled in the name of some abstract and undefined "New World Information Order", about which I will say a bit more later. We do not say that there is no need or room for improvement. But notwithstanding the occasional dissatisfaction which has been expressed with the ITU, we believe that this system has worked, does work, and can continue to work to accommodate changing needs on the part of member nations.

Another major objective we seek is to retain flexibility both in frequency allocations and the procedures that relate to them. In recent years this principle of flexibility has been called into question. The assertion is made that current procedures favor developed country interests and have had the effect of preempting developing countries' claims to the radio spectrum. In particular there is criticism of the system of ad hoc assignments. Under this system allocations are made to general services and each administration notifies the ITU of its intended use of frequencies as its requirements dictate. In lieu of this system, a number of administrations favor pre-fixed allotment plans whereby individual countries obtain fixed shares of frequency assignments in advance of specific requirements.

There is a surface appeal to the idea of pre-fixed allotment plans and in a number of cases, we have accepted the necessity of such plans—on a regional or world-wide basis—for certain services such as terrestrial broadcasting and aeronautical. However, as a general approach to frequency allocations, we think such plans can be wasteful and inefficient. Moreover, despite some dissatisfaction with the present method of making assignments, we believe it provides adequate opportunity to those countries having requirements to fill them. In fact, we know of no cases where countries have been unable to meet their requirements because of the present system of assignments. We are, however, sympathetic with the complaint of small countries that the present procedures are complex and costly for them. We are seeking ways of simplifying existing procedures and assisting smaller countries that find existing procedures unduly burdensome.

This last point brings me to another of our objectives, which is to accommodate other countries' needs consistent with our own requirements. Beginning in 1977, the U.S. has engaged in extensive international consultations on WARC with a view to explaining U.S. views on the Conference and obtaining information on foreign positions and requirements. To date, we have had meetings, on either a bilateral or multilateral basis, with over fifty countries around the world. As a result of these consultations, we have secured greater support for the U.S. proposals, and at the same time, we have been able to better understand the requirements of other administrations.

Within this set of broad objectives the U.S. has submitted extensive proposals to meet spectrum requirements for a wide variety of terrestrial and space services. Since the Committee is concerned only with space activities I will confine myself to those. I might note in passing that there is a close interrelationship between many terrestrial and space services: insofar as the requirements of a particular operational system may require a complementary use of both space and terrestrial operations. However, I will comment only on those allocations directly in support of space activities.

The use of the radio spectrum in space activities and the importance of this Conference to those activities is difficult to describe briefly. In very general terms I can begin with the obvious: space activity depends on the radio spectrum. Possibly you could put a satellite into space without radio, but without radio-based telemetry, command and control, you could not do much with it. The use of radio more than merely facilitates space activity, however: it is an integral part of the mission of most current space activities. I should explain that I am here using radio in its broadest sense—in which it embraces not only conventional communications (broadcasting, telephony) but also other "informational" activities such as radionavigation, remote sensing, radio astronomy, and space research. In fact, it even embraces activities that lie wholly outside

the fields of communication and information. Radio is also used for a variety of purposes which, in ITU terms, are classified as Industrial, Scientific and Medical (ISM) services. Conventionally, these have been used for such purposes as microwave cooking, diathermy, ultrasonic heating, and like purposes. We propose a new purpose: the transmission of solar energy from space to earth.

But I am getting ahead of myself. Let me review some of the major space services which the Conference will affect. I will confine myself to very summary remarks on the major areas where the U.S. proposes allocations changes.

BROADCASTING SATELLITE SERVICE

The broadcast satellite service (BSS) involves transmitting television or aural radio signals to large numbers of small earth terminals—as small as a meter wide, depending upon the strength of the incoming satellite signal. The United States pioneered this technology through NASA Advanced Technology Satellites (ATS) experiments, most notably in India in 1975 when the ATS–6 satellite provided educational and other public service broadcasting to over 2,000 isolated villages. Since that time a number of countries have indicated an intent to develop satellite broadcasting directly to home or community antenna receivers. Last month Comsat indicated its intent to develop such a service in the U.S. U.S. proposals for this service at the WARC are generally designed to strengthen and expand prospects for its use. They include:

Modifications in current regulations to permit aural broadcasting from satellites in one portion of the UHF band.

Relaxation of technical restrictions in the 2.5 GHz broadcasting satellite band to allow for possible use of an innovative BSS technology designed for large numbers of small earth terminals.

Realignment of allocations at 12 GHz in North and South America to provide for frequency separation between BSS and fixed satellite service. This is the most important new element in our BSS allocation proposal.

Provision for new allocation in the "higher" parts of the spectrum to allow for future expansion of BSS services.

The aural BSS allocation proposal and the proposal at 2.5 GHz are primarily aimed at the delivery of education, health care, and other public services.

The proposal for 12 GHz, involving both BSS and fixed satellite services, is controversial and important. The U.S. proposal arises out of decisions taken at the 1971 WARC on space matters and the 1977 WARC on broadcast satellites. Frequencies in the 12 GHz band were allocated to the BSS and the fixed satellite service on a co-equal basis in 1971 for Region 2 (North and South America). The 1977 WARC allotted the BSS frequencies on the country-by-country basis in Regions 1 and 3. We opposed this action, but we finally consented to it because its application to the Western Hemisphere was deferred until a later regional conference—now slated for 1983. However, as part of the compromise, we did agree to an orbital arc segmentation plan, the effect of which is to place severe constraints on the use of both broadcast satellites and fixed satellites in the Western Hemisphere. The U.S. proposals for WARC–79 advocate removal of this constraint by expanding the band and separating the two services into sub-bands. The effect would be to expand by a factor of at least three the number of broadcast and fixed satellites which could be accommodated. We place a very high priority on being able to achieve this objective in order to accommodate the diversity of space services and carriers which we expect in this frequency band in the future. We believe our proposal serves the interests of all countries in the Western Hemisphere. However, some countries, led by Canada, propose to put the entire issue off until 1983.

FIXED SATELLITE SERVICE

Of very great significance and controversy are our proposals to accommodate growth in the fixed satellite service (FSS) which provides point-to-point communications via satellites. This service did not exist at the time of the last general WARC in 1959 but it has developed and expanded dramatically since then. The United States has a strong interest, here and abroad, in assuring the continued viability of this service. So, too, do most other countries, both developed and developing. Unfortunately the area of the spectrum that is sought by international and domestic users is heavily used by other services. It will therefore be one of the most difficult challenges at the Conference to accommodate these requirements.

The U.S. proposals are designed to accommodate the freqeuncy requirements for these varying fixed satellite uses here and abroad. A sizeable increase in allo-

cations is proposed to meet INTELSAT's international fixed satellite requirements. Domestically, expanded wideband commercial requirements, plus some narrower-band public service transmissions, are also provided for. Of special significance is the proposal for 12 GHz mentioned earlier.

INTERSATELLITE SERVICE

To allow traffic to be routed between satellites in space without the need for a satellite-ground-satellite circuit, intersatellite communications are being developed. There are many potential technical and economic advantages to this, including reduction of potential interference by satellite circuits to earth stations and to traffic between terrestrial microwave stations. We propose a number of new allocations to accommodate this service.

MOBILE SATELLITE SERVICE

Mobile communications to ships, cars, airplanes or individuals on foot—are one of the fastest expanding areas of communications. By its nature, mobile communications depend entirely on radio links. Until very recently, it relied primarily on the high frequency bands for medium to long distance circuits. In the past decade, improvements in satellite technology have added a new dimension to the prospects for meeting vastly expanded mobile communication needs.

Mobile satellite services are going to be an increasingly important component in our global defense communications system. We propose to accommodate this requirement through certain allocation changes. We also propose some changes to accommodate the new INMARSAT system, as well as for other possible systems—such as a land mobile satellite system and an aeronautical mobile satellite system—which may be developed in the next two decades.

RADIODETERMINATION SERVICES

Radiodetermination services are another area where improved technology has widened the prospects for improved worldwide communications services. One aspect of overall radiodetermination services is radionavigation which provides safety of life and property primarily for airplanes and ships at sea.

U.S. proposals also call for important new allocations for radionavigation satellite services to provide for the new NAVSTAR Global Positioning System (GPS). Using 24 polar-orbiting satellites, GPS will provide worldwide accurate position information to ships and planes when it becomes operational during the next decade.

EARTH EXPLORATION AND METEOROLOGICAL SATELLITE SERVICES

Remote satellite sensing is one of the most significant and useful developments to come out of space research. Although the present remote sensing programs by LANDSAT use only optical sensing, future generations of LANDSAT and SEASAT will also employ microwave frequencies. There are two types of microwave sensors: active and passive. Active sensors are space radar-like devices that utilize information contained in the reflection of a radiated signal. Passive sensors collect data based on natural emissions from the earth's land masses, oceans and atmosphere or reflection of light from another source (e.g., the sun). Sensors have important uses for global economic development and environmental planning. The U.S. proposals provide for allocations for space-borne passive and active sensors and for space-to-space data links for transferring sensor data to relay satellites.

Related to environmental sensing is the meteorological service which is a vital part of the world's weather forecasting structure. This complex and intricate system relies to a large extent on radio systems and involves a number of varied systems throughout the spectrum. The U.S. proposes allocations to accommodate continuing and expanded requirements for current and future generations of meteorological satellites.

SOLAR POWER SATELLITE

We propose a single frequency for an experimental solar power satellite system. NASA and DOE are exploring the possibility of a geosynchronous satellite to collect solar energy, convert it to direct current and then transform it into microwave power for transmittal to collecting terminals on earth where it would

be converted into usable electric power. The U.S. proposal includes an allocation provision to accommodate the transmission component of this system in the event it proves feasible.

RADIO ASTRONOMY, SPACE RESEARCH, SPACE OPERATIONS

A wide variety of future advances in high-technology space research and radio astronomy are accommodated for in frequency allocations proposed by the U.S. In addition, we also propose allocations to serve operations requirements for satellite systems (telemetry, command and control).

As you can see from just this very cursory outline, the Conference has far-reaching responsibilities for accommodating the spectrum allocation needs of present and future space activities. And, as the leading space power, the U.S. has a special responsibility to ensure that the Conference does meet the needs of space. To that end we have prepared intensely for this Conference—more so than for any previous ITU conference in the history of our involvement with the ITU. Despite this preparation, we will confront many challenges.

Not least of the challenges will be to keep the Conference on the track of the agenda and not allow it to be derailed onto extraneous lines of general political debate. Unfortunately it appears that WARC is viewed by some of the participants—most notably those active in the "Non Aligned Movement"—as another forum for debating North-South issues generally and the so-called "New World Information Order" (NWIO) in particular. It may, therefore, be useful for me to mention very quickly what some of the principal issues of the NWIO dialogue are.

The term "New World Information Order" is somewhat misleading in masking several related but distant issues. Three are of special concern to the U.S. in connection with WARC.

There is, first, the debate over free flow and the need for more "balanced flow" of information. The debate has been focused on the Mass Media Declaration which was adopted at UNESCO last year. The U.S., initially resisting the idea of any declaration which would compromise its commitment to freedom of speech here and abroad, was successful in obtaining revisions to earlier drafts of the Declaration which could have impeded free flow. However, it seems very unlikely that we have heard the end of this question. There is some possibility it will arise at WARC.

Related to the Mass Media issue is the debate in the U.N. Outer Space Committee over DBS—direct broadcast satellites. A majority of countries on the Committee appear to be committed to some form of prior consent as a prerequisite to satellite broadcasting beyond national borders. The U.S. insists, again, on a principle of free flow of information. For the time being the resolution is stalemated in the Outer Space Committee because that Committee works on the basis of consensus. However, the debate could arise at WARC.

The reverse side of the DBS issue is presented by satellite sensing. A number of countries have pressed for a requirement of prior consent by sensed countries as a prerequisite to the dissemination of sensing data, or even to being sensed. This is the reverse of DBS since the concern arises over the flow of information from within the country to other countries outside—rather than the other way around. But the underlying issue is quite similar insofar as it pits assertions of national sovereignty against freedom of information. As with DBS, the issue is pending before the U.N. Outer Space Committee. As with DBS, the issue could arise at WARC in the context of specific allocations for this service.

Underlying all of the concerns of the developing nations and the so-called New World Information Order is a perception by developing countries of the developed countries' dominance of world communications. One means of redressing the imbalance is through increasing the availability of information technology and services to the LDCs. The means of enhancing their capabilities take a variety of forms—ranging from development assistance to proposals for the radio spectrum to favor the Third World. Also worth noting is a proposal by Columbia and other equatorial countries, pressed in the U.N. Outer Space Committee and in other forums, which claims sovereignty over the orbital space above their respective countries. The U.S. is opposed to the Colombian proposal, and only a modicum of support at WARC is foreseen. As for development assistance, assistance for communications competes with assistance for health care, food and other essentials to meet basic human needs. The U.S. has, however, recently committed itself to a very important assitance program which involves both

basic human needs and communications. The proposal involves the use of satellites for rural communications in developing countries—basically along the lines of the Indian SITE program conducted several years ago. This U.S. commitment should help to create a favorable climate at the WARC, demonstrating that the developed and developing nations alike have a common stake in modernn communications systems. We are also exploring the possibility of bilateral and multilateral measures to provide specific assistance in the area of spectrum management.

The above "political" issues are tangential to the WARC agenda. But any or all of them could influence WARC 1979. In general, we think WARC is not a proper forum for debate on the New World Information Order or kindred political issues. The strength of the ITU has always been its ability to arrive at general agreement on matters where agreement is imperative. This has been possible because the ITU has been concerned with technical problems which can be resolved without ideological debate. We hope this strength of the ITU will not be compromised by a debate over highly abstract issues of political ideology which are not amenable to resolution at this kind of conference.

Mr. Chairman, that completes my prepared testimony. I will be pleased to respond to any questions you may have.

STATEMENT OF GLEN O. ROBINSON, CHAIRMAN, U.S. DELEGATION TO THE 1979 WORLD ADMINISTRATIVE RADIO CONFERENCE

Mr. ROBINSON. Thank you, Mr. Chairman.

I appreciate this opportunity to appear before the committee to discuss the 1979 World Administrative Radio Conference and its implications for international space activities.

I might begin by saying a few words about the Conference itself before getting into some of the substantive issues.

The World Administrative Radio Conference is an activity of the International Telecommunications Union, which is a 154-member specialized agency of the United Nations that specializes in international radio regulations. It promulgates international radio frequency regulations and establishes other international standards for telecommunications generally.

The 1979 World Administrative Radio Conference, which convenes in Geneva this month, will review the allocation of radio frequencies throughout the world as well as related radio regulations governing the use of radio frequencies and will make any necessary modifications considered necessary in light of developments over the past 20 years. The WARC will be a big affair by almost any measure. In size and complexity it's probably the largest, or certainly one of the largest, conferences of its kind in which the United States has participated for many years. It is currently anticipated that over 140 of the 154 members will be participants and that there will be over 1,400 delegates to this Conference.

The importance of the Conference lies in the fact that it will be the first general conference of its kind in 20 years, with the power to consider all uses of the radio frequency spectrum as well as related technical and procedural provisions governing the use of the radio frequency spectrum. We anticipate that there will not be another conference of comparable scope and importance for another 20 years.

So roughly what we're talking about is a conference attempting to make up for the past 20 years of development and forecast 20 years of development into the future.

The U.S. objectives at the Conference can be summarized very briefly as follows:

No. 1, we seek incremental or marginal changes in certain allocations and regulatory procedures that are tailored to changing technology and to new and changing social and economic needs. Our proposals do not, however, seek a radical revision of the structure of the ITU or the allocations made by the ITU or other related regulations. We have viewed, in fact, with great skepticism the claims by some, particularly in the Third World, that the ITU needs to be revolutionized and its regulations radically overhauled in order to accommodate the needs of a yet undefined "new world information order," about which I will say a little bit more in a moment. We don't say that there is no need for improvement in the existing system, but all in all, we are well satisfied with the ITU and its work to date. We think that it has not only looked after the needs of developed countries such as the United States, but it has also very well looked after the needs of developing countries as well.

Another objective we seek in addition to making marginal changes in the current regulations is to retain the flexibility which inheres in the present structure of regulations and allocations, and this is an important objective because perhaps more than any other it has been called into question in recent years. The assertion has been made, quite commonly among developing countries, that the current procedures favor developed country interests and have have had the effect of preempting developing countries' claims to the radio spectrum. In particular, there is criticism of the system of making allocations and assignments whereby allocations are made to particular services and then it's up to each individual administration or country to file for the frequencies as they are required. This sort of ad hoc system, it is said, favors the interests of developed countries who can get to the spectrum and use it first and thereby preempt it.

We think that this is not a fair claim. We acknowledge the concern of the developing countries that they have some form of assurance of access to the radio spectrum and to the geostationary orbit for purposes of satellites. But we think that the present system is designed to accommodate their interests, and we think that, in particular, the proposals which some of the developing countries have made for what we call a priori plans are unwise. These a priori plans would basically take the radio spectrum, carve it up, and give particular frequencies, or particular segments of the geostationary orbit on a country-by-country basis.

There is a certain surface appeal to these kinds of plans, and in a number of cases we have ourselves supported the use of such plans for certain services that require such a scheme of planning. But in general we have resisted it as being wasteful and inefficient. It tends to make assignments of frequencies in anticipation of real needs, and frequently what you have is countries having a set of assignments which they never can hope to implement; also, because it tends to be inflexible it tends to retard technological innovation of a kind which would promote efficient use of the radio spectrum.

So we are trying to oppose, in general, the idea of so-called a priori planning as an approach to spectrum management generally, and we seek to retain the existing flexibility which inheres in the present procedures.

A third objective of the United States is to accommodate other countries' real requirements and needs, consistent, of course, with our own requirements. Although we are not terribly enthusiastic about the scheme of planning which I just mentioned, we are sympathetic with the need to accommodate developing countries, in particular in their desires to have full and fair access to the radio spectrum.

We have engaged extensively in international consultations for a period of over 2 years with a view to not only explaining our posposals to the rest of the world but also seeking to get their ideas and their views in order to attempt to accommodate as far as possible the needs of other countries.

Those are the three very general objectives.

In terms of specific proposals, specific objectives, the United States has a rather extensive set of proposals for allocations changes or regulatory changes. I won't try to recite these in detail. I would be happy to submit a full copy of the proposals for the record if the committee desires. Since the committee is interested only in the space aspects of the WARC, I will confine my remarks just to briefly reviewing what are some of our proposals and what are some of the issues as they relate to space activities.

The use of the radio spectrum in space activities and the importance of this Conference to those activities is difficult to describe in very brief terms. In general terms I can begin with the obvious: Space activity depends on the radio spectrum. Possibly you could put a satellite into space without the use of radio, although I doubt that as a practical matter it could be done. But in any case, without radio-based telemetry, command and control you couldn't do anything with the object once you got it there. So to that extent all space activity is critically dependent upon the use of radio. The use of radio is important to space activities not only because it facilitates the activity; in many cases, indeed, perhaps I would say in most cases, space activity right now is oriented around communications. Communications is an integral part of the mission of most current space operations.

I should explain that by "communications" here I am including a variety of different kinds of services, information-based activities, including not only the conventional broadcasting and telephony services but also such things as radio navigation, remote sensing, radio astronomy, space research, and the like. There is one other also that is not a communications service at all, which I will say a word about later, and that is the use of radio frequencies for transmitting power to the Earth, solar power to the Earth.

I'm getting ahead of myself a little bit. Perhaps I should back up and explain in more orderly detail the specific proposals that the United States has submitted to the ITU.

We can begin with the Broadcast Satellite Service. I think I don't need to go into detail and explain what the Broadcast Satellite is. The United States has pioneered this technology through the use of the Advanced Technology Satellites experiments, and now you've probably read recently that Comsat has proposed to develop such a service in the United States.

Until the announcement by Comsat I think it's fair to say that most countries had more advanced plans than did the United States for actual implementation of the Broadcast Satellite Service as an

operational service. Nevertheless, we have always considered it to be an important option, and insuring adequate radio frequencies and orbital space for this important service is a high U.S. priority.

We have a number of different proposals to accommodate the Broadcast Satellite Service, and I'll just mention a couple of them.

One is a proposal to accommodate sound broadcasting radio, as opposed to television, in one portion of the UHF band. This would be of significance primarily in the Pacific basin region. I don't know that there is any immediate plan to implement this, assuming we get the allocation, in the United States. But it could have an important impact outside the United States.

We also propose some changes in current restrictions on the use of one particular broadcast satellite band to allow for the possible use of new technologies that are not in conventional terms either broadcast satellite service or fixed satellite service. They are kind of a hybrid. This would be primarily for world health care, education, and the like, much along the lines of ATS-6 experiments.

We propose a very important and very controversial change in the present alinement of allocations at 12 GHz in region 2—this is North and South America—in order to provide for a frequency separation between the Broadcast Satellite Service and the Fixed Satellite Service which currently share this band.

The U.S. proposal here stems from the results of the 1977 World Broadcasting Satellite Conference, which dealt with the Broadcast Satellite Service at 12 GHz exclusively. The results of the Conference were widely regarded as a defeat for the U.S. interests. I won't say whether that's absolutely accurate or not. I think the verdict isn't in. A lot depends upon what we can accomplish in 1979. Suffice it to say that the results of the 1977 Broadcasting Satellite Conference left us with quite an impossible situation for region 2. The Conference developed for region 2 a plan—an interim plan—of arc segmentation whereby broadcast satellites were put in certain parts of the orbit, and fixed satellites in certain other parts of the orbit, the overall effect of which was to put very severe constraints on our ability to accommodate our domestic satellite interests in both the Fixed and the Broadcast Satellite Services.

We have proposed to eliminate this constraint and to expand the effective use of the orbit by allowing the satellites to share the entire orbital segment in use for region 2 and to separate the two services by frequency. The effect of this would basically be to expand the number of satellites on the order of three or four times what is now available for both services, both the Broadcast Satellite Service and the Fixed Satellite Service.

Unfortunately, we've had a little difficulty in negotiating this, on a bilateral basis at least with Canada, which, for a variety of reasons too complicated to explain now, wants to put off the entire decision until 1983, when there is a special planning conference for the use of the broadcast satellite service in region 2. We have pushed rather strongly for immediate resolution of this. We think we've found the answer to the problem, and, since we have immediate requirements, particularly for the fixed satellite service area, to accommodate such systems as the satellite business systems and other advanced fixed satellites, we very much want to resolve this in 1979.

Finally, in the broadcast satellite service area we do propose a few new frequencies higher in the radio spectrum. They would not be for immediate implementation. They're really for a decade or so down the pike.

I've already mentioned briefly the fixed satellite service.

The fixed satellite service is a service that encompasses actually a number of different uses, but basically all point-to-point type uses such as telephony, data, video signals, et cetera. Our problem here is to accommodate both the increased domestic needs and the international needs. If you set aside the 12 GHz, the problem I just spoke of, our primary concern here is to accommodate the growing needs of Intelsat. Unfortunately, the spectrum which is most desired for the Intelsat system and for the fixed satellite system generally is right now quite congested, so we've had an extremely difficult time trying to come up with the required new allocations to accommodate Intelsat.

We think we have proposals that will do it adequately, but selling them worldwide will be a challenge. This is a case simply where everyone has a different set of proposals for meeting basically the same requirements. It's a question of trying to shoe-horn in the new allocations in a way which is compatible with existing services.

We have intersatellite service to be accommodated. This would allow transmissions between satellites and thereby eliminate satellite-ground-to-satellite circuits. We expect this will be an important new activity in the future. We propose a number of new allocations to accommodate intersatellite communications.

Mobile satellite services: We have a variety of new mobile satellite services. Of special note here is the requirement for mobile satellite allocation to accommodate current defense systems. The current defense systems which are being operated are essentially of a mobile character, but they're being operated under fixed satellite service allocations, which creates some technical problems of coordination. So in order to accommodate our needs here we are proposing a mobile satellite service allocation for the first time.

Mobile satellite services are going to be also in demand for commercial services. We propose changes to accommodate the new Inmarsat system, for example, and we also have proposals for an experimental new system being considered by NASA, a land mobile satellite system. Perhaps several years down the road also we may have an aeronautical mobile satellite system, and we are proposing allocations changes which will accommodate that system.

Radiodetermination systems: Of special note here is a proposal to accommodate the new Navstar GPS, or global positioning system. This is one of the most important innovations in radionavigation in the history of communications technology. Using 24 polar-orbiting satellites, the GPS will provide worldwide accurate position information to ships, planes, and all forms of mobile transportation when it becomes operational in the next decade. This will be available both for civilian and for military use, although the primary impetus for us right now is probable military use.

We have extensive proposals to accommodate remote satellite sensing, or Earth exploration, as we call it. Remote satellite sensing is one of the most significant and useful developments to come out of space research. Although the present remote sensing programs by Landsat

use only optical sensing, future generations of Landsat and Seasat will also employ microwave frequencies. This will permit sensing in all kinds of weather conditions, 24-hour sensing, day and night, et cetera.

Tehre are two types of microwave sensors active and passive. The active sensors are space-borne radarlike devices that utilize information contained in the reflection of the radiated signal. The passive sensors collect data based on natural emissions from the Earth's surface.

I think I probably don't need to go into the importance of remote sensing. It is now widely in use for weather forcasting, predicting crops, used in geological exploration, a variety of such uses, and will become increasingly important in the future. These new frequencies that we's seeking are vital to the future generations of remote sensing programs.

Related to the experimental—still experimental—Earth exploration services, the meteorological satellite service is, of course, an operational system. The United States participates with other countries in the World Meteorological Organization in providing a global meteorological service. We propose a number of new allocations to accommodate future needs of this service.

I mentioned a short time ago the experimental solar power satellite system. NASA and DOE are exploring the possibility of a geosynchronous satellite to collect solar energy, convert it to direct current and then transmit it to the Earth by microwave. There it would be converted into usable electric power. We have proposed an allocation. Actually, it's not, strictly speaking, an allocation; it's a footnote designating a certain frequency as the frequency for the transmission component of this system in the event it becomes feasible. We don't know whether the system itself will be feasible. Our concern is just to secure the important frequency that is needed to transmit the power to the Earth.

This will be a quite controversial item. There are environmental concerns. There are also engineering concerns. The spillover or interference from the service is a matter of widespread concern to some countries. Suffice it to say that while recognizing those concerns we think it's important to at least designate the frequency in anticipation of successful development of the system itself.

Finally, we have a variety of proposals to accommodate radio astronomy, space research, and space operations. These are pretty much scattered throughout the radio frequency spectrum. I don't think I could single out any one of them as more important than another. The space operations, of course, are significant, as providing the basic command and control service required to sustain the space activities in general.

As you can see from this cursory outline, the Conference has some far-reaching responsibilities for accommodating the spectrum allocation needs of present and future space activities. As the leading space power, the United States has a special responsibility to insure that the Conference does in fact meet the needs of future space activities. To that end we have prepared quite intensively for this Conference. In fact, I think it's fair to say we have prepared more intensively for this Conference than for any comparable radio con-

ference in the history of our involvement with the ITU. Despite this preparation, we will confront a number of challenges.

Not least of those challenges will be to keep the Conference on the track of the agenda as it has been set by the ITU and not allow it to be derailed onto extraneous lines of general political debate or general political rhetoric. We allow, of course, for a certain amount of general political debate and discussion. That in itself doesn't bother us, so long as the Conference doesn't get derailed on highly abstract and ideological lines of political discord.

Unfortunately, it appears that WARC is viewed by at least some of the participants, notably those active in the nonaligned movement, as another forum for debating North-South issues and the new world information order, which has been much in vogue in the past couple of years. It may, therefore, be useful for me to mention very quickly some of the principal issues of the new world information order dialog which are pertinent to the World Radio Conference.

There are primarily three concerns that may arise at the WARC.

There is, first of all, the general debate over free flow of information versus "balanced flow" of information, and those are the opposing labels in a longstanding debate that has been conducted in UNESCO. The debate crystallized last year at the UNESCO annual meeting. It was temporarily put to rest—or so everybody hoped—in a mass media declaration, the effect or the general thrust of which was to recognize the importance of free flow but also the importance of balanced flow, and it contains a little bit of something for everybody.

I said that there was the hope that the mass media declaration, which was adopted by consensus at UNESCO, would set to rest the general debate which had become quite strident over the years. In fact, it appears that it's not going to set that debate to rest at all, and we see the same kind of confrontation, if you will, or the same kind of debate arising in other conferences, and particularly at the WARC.

Related to the mass media issue is the debate in the U.N. Outer Space Committee over direct broadcast satellites. The majority of the countries on this committee appear to be committed to some form of prior consent as a prerequisite to satellite broadcasting beyond national boundaries. The United States insists, as it does in the general debate over free flow, on no political restrictions, no political impediments, to free flow or free speech. For the time being the resolution of this issue is pretty much stalemated in the Outer Space Committee. But we anticipate the possibility of this being raised in the WARC. It could come up in a variety of ways. It could come up as general background debate or discussion, or it could be tied to the specific use of broadcast satellite allocations.

The reverse side of that issue is presented by satellite sensing. A number of countries have again pressed for a requirement of prior consent by the sensed countries as a prerequisite to the dissemination of sensing data, or even to the act of being sensed from outer space. I say this is the reverse of the direct broadcast satellite issue because here, of course, the objection is not to the transmission of information coming into the countries, but, rather, the reverse, the invasion of national privacy.

The underlying issue, however, is fundamentally the same for us in terms of political principles. As with the direct broadcast satellite, so

also with the remote sensing issue, the United States is adamantly opposed to any form of prior consent. Here again this issue could arise at WARC since we are seeking extensive accommodations for remote sensing.

Underlying all of the concerns of the developing countries and the so-called new world information order is a perception by the Third World that the developed countries dominate world communications. One means of redressing the imbalance is by increasing the availability of information technology and services to the LDC's. The means of enhancing their capabilities take a variety of forms—ranging from development assistance to proposals for the radio spectrum allocations which would favor the Third World. Also worth noting in this connection is a proposal by Colombia and other equatorial countries, pressed in the U.N. Outer Space Committee and in other forums, which asserts a claim of sovereignty over the geostationary orbit, that is, the portion of the orbit lying above their respective countries. As you would expect, and as you know, the United States is firmly opposed to any such assertions of sovereignty. We do not anticipate that this will gain any ground at the WARC. It clearly will be raised. We know that it will be raised; the claim will be made. We hope that it will gain no more support, however, than it has in previous meetings, where it has always been raised more or less as a matter of form. It appears not to have very significant support, primarily because there are so few equatorial countries that could make the claim.

More generally, in the field of development assistance it is thought that the whole question of assistance for communications services, and most notably perhaps satellite services, could arise at the Conference.

The United States has made some important strides forward in the last couple of years in offering assistance in the field of communications, but I have to report that as a general proposition communications does not occupy one of the higher priorities as far as development assistance generally is concerned.

Last year at UNESCO Ambassador Reinhardt announced an important new initiative undertaken by AID to provide assistance in the development of rural satellite projects. This would be assistance primarily in hardware for Earth stations and in software for a program similar to the ATS–6 and the Indian site program conducted several years ago.

Recently we have also pledged some assistance, as you know, at the U.N. Conference on Science and Technology for Development (UNCSTD) in the area of remote sensing.

We take the position that although we are prepared to talk about some of these initiatives at WARC they are not really part of the Conference agenda, so we would rather not engage in extensive discussions of them. But they are, again, part of the general political background which will almost certainly arise. In general, in fact we think that none of the political issues that I have mentioned, whether it's prior consent or development assistance, really should occupy an important part of the negotiations at the WARC.

The strength of the ITU has always been that it has worked along fairly technical lines. To be sure, there are political considerations that must be debated, but it has always been able to focus on more or less technical issues and come to an effective resolution of them. We think

that if it ever gets far away from those to debate issues of the New World Information Order it will compromise the vitality of the ITU.

Mr. Chairman, that completes my prepared remarks, and I would be happy to respond to any questions.

Mr. FUQUA. Thank you, Mr. Robinson.

In view of the fact that we are running considerably behind, and I do have some questions, in the interest of time I will submit them to you in writing for answers.

Mr. ROBINSON. Fine. I'll be pleased to answer them, Mr. Chairman.

Mr. FUQUA. Mr. Brown, do you have any questions?

Mr. BROWN. Mr. Chairman, let me make one general observation, but I will not belabor the issue, and submit additional questions in writing also.

Mr. Robinson, I'm very much impressed with your presentation. There's a great deal in it that I would like to see elaborated. But one of the underlying problems basically is how we relate these political forces that you mentioned, how we manage them in such a way that we can resolve the technical issues on a reasonable basis, and you have suggested on page 12, or made the specific statement:

> One means of redressing the imbalance is through increasing the availability of information technology and services to the LDCs.

What I'm trying to get at is the degree to which there is any coupling between the technical work going on in WARC and the responsibility to develop and promote political initiatives which will help reduce these political pressures.

Is there that kind of connection between, say, your role and Ambassador Rhinehart, of Ambassador Pickering, or some of the other people who are involved in trying to meet the needs of the less developed countries for an expedited development path through science and technology?

Mr. ROBINSON. That's an excellent question, Mr. Congressman. I think the answer is yes, but with some—the answer, in terms of my activities, is an unqualified yes.

I would have to say, however, that we live in a world of constraints here. I was very active in getting AID approval for the world satellite program, and I think its' fair to say that it was in part the interests of UNESCO, the UNESCO Conference, and the WARC that were instrumental in getting this AID initiative off the drafting board and into implementation. So that's one example of the active role that I have personally tried to play.

We also have tried to pursue some other initiatives, specifically to further our own interests, but also to show that we are forthcoming on these kinds of problems.

I have to report that in general, however, communications assistance is not a high priority. The World Bank, for example, which is interested in meeting basic human needs, does not apparently regard communications technology at least as one of those basic human needs. AID, I think, has similar priorities, although they are within the confines of their other priorities and their budget. I think they are starting to come around to looking at communications as an important ingredient of development assistance generally. Much of that, however, is going to be several years down the road, and so it won't really

benefit immediately. But we have tried to put together some initiatives specifically dealing with the area of spectrum management, which would be perhaps funded by a consortium of U.S. agencies including the FCC, Commerce, and AID. But it's still very much in the preliminary planning stage.

So yes, we are very mindful of these. Again, whenever we turn around, however, we are staring a bottom line of a budget in the face and there's not too much we can do.

Mr. BROWN. It seems to me this is a distorted priority which you reflect because it seems that the essence of the developmental problem is one of communication of the information required.

Mr. ROBINSON. Yes.

Mr. BROWN. To eliminate that state of underdevelopment, it provides a path of communication of appropriate information through, of course, educational improvement, health improvement, and agricultural improvement, all of the things that we are concerned with, which provides a vehicle for the scientific and technological health, creating of the country or the region just by virtue of having access to this kind of technology.

Mr. ROBINSON. I agree with you, Mr. Brown. I think that's a point that's been, unfortunately, neglected. We're not really talking about just transfer of technology. We're talking about, really, information transfers, which are the very essence of meeting basic human needs. Education and health care, for example, are dominated by the transmission of information, and no one denies that health care and education are basic human needs. They are high on the priority of every assistance project we have.

But when it comes down to putting money out for, say, developing a microwave system to assist in the development of the basic telecommunications structure of a country, or a satellite, or something like that, some of those connections get lost sight of.

Now I should point out that I think this is turning around. I think that more and more the information-based activity, the communications activity, is being seen as an important ingredient of the basic human needs theme.

Mr. BROWN. It appears that the Chinese see this.

Mr. ROBINSON. Oh, I think so. I think so.

A lot of this, however, has to do with getting the countries who are the AID recipients to put communications activities as a priority within the country. If they don't see it as a priority, then it's pretty hard for us to insist that it must be prioritized over, say, providing fertilizer or tractors, or what have you.

Mr. BROWN. It seems to me that this pressure for a new world information order, or whatever it signifies, is an indication that many of these countries do perceive its importance, although at the individual country level they have infrastructure problems and can't do much about improvement of Third World communications.

Mr. ROBINSON. I think that's right.

Mr. BROWN. Thank you very much for your contribution.

Mr. FUQUA. Thank you, Mr. Robinson. We appreciate it.

Mr. ROBINSON. Thank you.

[Questions and answers are as follows:]

Question (1). The Congressional Research Service recently completed a study entitled "The World Administrative Radio Conference of 1979: U.S. Preparations and Prospects." Do you agree with its conclusions that the U.S. attitude towards the GWARC is one of "cautions apprehension"? If you do, what is the primary source of this apprehension? If you do not, how would you characterize the U.S. attitude? Is your delegation fully prepared for the conference, technically as well as potlicially? If not, why not, and what can be done to remedy the situation at this point?

Answer (1). I believe the Congressional Research Service misrepresented the U.S. attitude toward WARC–79. Rather than "cautious apprehension", I have always that we are "cautiously optimistic" regarding the Conference. While recognizing that we have many technical and political barriers to overcome at WARC–79, it is my belief, and I think the belief of my colleagues, that these barriers are not insurmountable. There is no doubt that compromises will have to be reached, with all nations accepting something less than they would prefer. But I believe the basic objectives of most nations are compatible.

In both technical and political terms, the U.S. is fully prepared on all issues. U.S. preparations have been under way for over five years, involving broad participation by government and private sectors. It has been by far the most extensive preparation that the U.S. has ever undertaken for an ITU conference.

Question (2). What will be the role of delegation members designated "advisers," which include several with space communication interests (such as COMSAT, Rockwell International and the Satellite Transmission Committee of the ABC, CBS and NBC Network Affiliates Association)? Will these delegates have an official role in stating and negotiating U.S. policy?

Answer (2). All delegates will be active participants in conference work. However, only those who are designated by me as spokesmen have the role of speaking for the U.S. in stating official positions. In some cases I have designated private industry representatives as spokesmen, under the guidelines set forth in the recently amended conflict-of-interest law.

Question (3). In testimony before the House Foreign Affairs Subcommittee on International Operations on June 14 of this year, you identified three areas in which you expect considerable resistance to U.S. proposals: increases in HF broadcast frequency allocations, increased requirements for satellite allocations, and ensuring fair and equitable access by all nations to the spectrum and geostationary orbit. In the intervening months, has the situation regarding these issues changed? What is your current estimate of U.S. chances for winning on these issues?

Answer (3). The situation regarding these issues has not substantially changed since my testimony of June 14. Many of the developing countries have held meetings since June to solidify their positions. Therefore, we are still expecting opposition on the points mentioned in your question. As I mentioned in my testimony, however, what kinds of compromises or trade-offs may be possible to meet developing country concerns will have to await further conference negotiations. I am confident that we can constructively deal with these concerns if we can keep the discussions focussed on their specific merits and keep to a minimum ideological politics and confrontational rhetoric.

Question (4). Although GWARC is a technical meeting, it appears quite likely, that non-technical issues will arise as well. Are you prepared to debate topics such as prior consent, related to distribution of data gathered by earth resources satellites and to direct broadcast satellites? What is the official U.S. position on these topics?

Answer (4). The U.S. delegation is prepared to address non-technical issues such as prior consent, although we believe WARC is an inappropriate forum for most such discussions. We will press to minimize all debate at WARC, on issues that are not directly pertinent to the WARC agenda and the specific functions of the ITU. However, we are fully prepared to defend U.S. positions on all questions, whether technical or not.

Regarding your question concerning the U.S. position on "these topics", on the particular issue of prior consent as a restriction of broadcasting or distribution of remote sensing data, the U.S. is vigorously opposed to any such restriction.

Question (5). Some of the less developed countries (LDC's) advocate assignment of slots in geostationary orbit even to countries without a satellite to place in such an orbital slot, and allowing these countries to "rent out" the slot until such time as they place a satellite there. What is the current status of this debate? What is the U.S. position?

Answer (5). The debate over allotment plans will be a major issue at the WARC. I should point out, however, that such plans do not necessarily contemplate renting out the allotted frequencies or orbit positions. The key idea behind the proposal for planning satellite frequency assignments is to ensure that there is an even distribution of frequencies and orbit positions.

The U.S. is not opposed to all allotment plans. We accept the necessity for such plans in certain cases (e.g., the aeronautical and maritime mobile services are both subject to such plans). However, in the area of satellite services we are not satisfied that such plans are necessary or desirable. Current proposals to plan the fixed satellite service in particular seem to us likely to lead to inefficient use of frequencies and orbital slots.

Question (6). Some of the equatorial countries have made the claim that the portions of geostationary orbit which exist above their countries is national property subject to their rule, and for which they can charge the user a fee. What is the status of this debate? Is the U.S. position against claiming national sovereignty in space still the same as enunciated in President Carter's June 1978 directive on space?

Answer (6). The debate is continuing in the Peaceful Uses of Outer Space Committee of the United Nations. This should not be a large issue at WARC–79, although several countries will make remarks supporting their claim. The U.S. position has not changed since President Carter's June 1978 directive.

Question (7). What is the U.S. position on rendering technical assistance to LDCs in communications technology (terrestrial and space) in exchange for their cooperation at GWARC? How much assistance has the U.S. already provided in this area?

Answer (7). We are exploring several possible options concerning technical assistance, although our efforts will necessarily be quite modest. Basically, we believe that a substantial technical assistance program could have a positive effect on WARC–79 deliberations, but we are not attempting to make a direct link between assistance and "cooperation" at the WARC as suggested in the question.

On the amount of assistance for communications, a precise figure is difficult to derive from the different assistance activities. AID calculates that in its different projects (most of which are not specifically or entirely communications projects) some $12 million was obligated in fiscal year 1978. In addition to these funds, the U.S. contributes to multilateral assistance through the UN Development Program. In 1978 the UNDP contributed about $18 million to the ITU's communications development activities and about $4.5 million to those of UNESCO. The U.S. contribution to UNDP is, currently, approximately 19 percent of all UNDP funding.

For the future, it is expected that bilateral AID assistance will increase slightly. Noteworthy in this respect are the AID rural satellite project and continuation of NASA assistance in remote sensing activities.

Question (8). Should the U.S. lose on its major proposals at GWARC, what realistic options exist for U.S. action? Is it feasible for the U.S. to withdraw from the International Telecommunication Union? What would be the repercussions if the U.S. takes a number of reservations to the treaty which emerges from GWARC?

Answer (8). We must differentiate between losses on our major proposals and compromises that still satisfy a significant portion of our requirements. The U.S. does not expect to have all of our major proposals adopted in their totality. Our proposals reflect our initial or going-in position. Like all other countries attending the WARC, the U.S. has fall back positions for each of its proposals. Naturally, how far the U.S. can fall back varies with the specific service and frequency bands. As examples of possible options involved when the U.S. is confronted with opposition to a major proposal, the following will illustrate our general strategy to fulfill requirements. If an objection is centered upon a specific frequency band, we would ascertain if another band is suitable. Alternately, we may propose that one service or another accept a secondary status. As a third option, one or more countries could take a footnote, thereby officially advising all other nations of their specific concern and operational requirements.

Furthermore, resolution of the problem may be reached by adjusting the technical parameters of one or more of the systems concerned. As a last resort, the U.S. might take a reservation if the resulting situation was totally unacceptable to us.

Regarding your second question, there is no basis whatsoever for considering U.S. withdrawal from the International Telecommunication Union at this time. Despite all of the anxieties expressed over the 1979 WARC, we do not now foresee such a breakdown in the integrity of the ITU as would cause us to consider such a withdrawal.

Concerning your last point, it is impossible to predict the repercussions if the U.S. takes a number of reservations to the final acts of the 1979 WARC. This would depend entirely upon what specific items were involved.

Question (9). At the 1977 WARC on Space Broadcasting, Regions 1 and 3 accepted a geostationary arc segmentation plan which the United States (in Region 2) rejected, and for which we have a counterproposal to offer at the 1979 GWARC. Rather than segment the geostationary arc itself for broadcast versus fixed satellite services (for example, broadcast satellites would be positioned from 140°W to 170°W longitude and fixed satellites from 100°W to 140°W), the U.S. counterproposal would change the frequency allocations, so that broadcast services would operate in the 12.2–12.7 GHz range, and fixed in the 11.7–12.2 GHz range, without regard to their placement in geostationary orbit. What has been the reaction by other nations to the U.S. counterproposal? Especially, how has Canada reacted, since it plans a terrestrial microwave system in the 12.2–12.7 GHz range with which the broadcast satellites might interfere? Must Region 1 and Region 3 also agree to the U.S. plan, or can it be implemented for Region 2 alone? What would be the impact on the number of available satellite positions for fixed and broadcasting services for Region 2 if the U.S. proposal is accepted in lieu of the plan accepted by Regions 1 and 3?

Answer (9). First, I must clarify a point in your question. The United States did not reject an arc segmentation plan for broadcasting satellites at the 1977 Broadcasting Satellite Conference. The U.S. accepted arc segmentation for Region 2 until a regional planning conference could be convened in 1982 (subsequently changed to 1983). Since the 1977 conference, the United States has developed an alternative approach for frequency allocations to the Broadcasting Satellite Service and the Fixed Satellite Service in the 12 GHz band. Our approach proposes frequency separation for the two services and has the effect of approximately tripling the number of orbital slots and frequencies available for countries in Region 2. Nations such as Brazil and Chile have endorsed our proposal, while others such as Canada, Argentina, Mexico and Venezuela would prefer to see the decision put off until the 1983 regional broadcast satellite planning conference. Incidentally, Canada's present position stems not from its use of terrestrial microwave in the 12.2–12.7 GHz range—though that was originally its concern—but from a desire to keep its options open for a special type of hybrid broadcast-fixed satellite.

Whatever the outcome on the arc segmentation versus frequency separation issue, it is essentially a matter for Region 2—so long as the plan for Regions 1 and 3 is not adversely affected (and there is no reason for it to be affected).

Regarding the last questions, there is some confusion about what frequency separation, if adopted, would accomplish. It would increase the number of available orbit positions for fixed and broadcast satellites by as much as three times the current number (depending on assumptions as to required spacing). However, this increase does not mean that there would be no plan. On the contrary it appears that Region 2 will still decide in 1983 to plan the broadcast service in the 12 GHz band—wherever that service is finally located in the band.

Question (10). What is the potential impact on U.S. technology from changes in frequency allocations at GWARC? If the U.S. counterproposal to the arc segmentation plan is adopted, will there be greater requirements for high technology (for example, beam shaping), and if so, how many other Region 2 countries would have the capability to conform with the U.S. counterproposal? Is this question of high technology requirements likely to bear on acceptance or rejection of the U.S. counterproposal?

Answer (10). The potential impact on U.S. technology from possible changes in frequency allocations is difficult to evaluate without specifying what particular changes and what particular services are involved. Obviously if adequate allocations are not made to certain services, both the service and the associated technology could be jeopardized. An example is the requirement for certain fre-

quencies for future generations of Landsat and Seasat employing microwave as well as optical sensing. Unless required frequencies are allocated, microwave sensing will not be possible. Short of total denial of required allocation, changes in the bands allocated could impact existing and future technology. For example, narrowing the bands for radiolocation could adversely affect existing and future radar systems.

With specific regard to the U.S. proposal at 12 GHz it is possible to predict particular impacts on fixed and broadcast satellite technology. If the U.S. proposal of band segmentation between the fixed-satellite service (FSS) and the broadcast-satellite service (BSS) is adopted, a three-fold increase in frequency spectrum and orbit space will become available to these services at 12 GHz. Hence, the pressure for more spectrum efficient technology will be relaxed somewhat.

On the other hand, if the status quo (arc segmentation and frequency sharing) is maintained, the need for more efficient use of the spectrum/orbit resources at 11.7 to 12.2 GHz is immediate. BSS and FSS characteristics would likely be set by the 1983 Regional Administrative Radio Conference to achieve a maximum number of orbit positions using the most advanced technology available. Likely technology developments required are shaped beam and low sidelobe antennas to reduce intersatellite spacings. Broadcast satellites and fixed-satellites would be required to have similar effective radiated power levels to increase orbit use efficiency. Improved modulation techniques would be required to reduce bandwidths. "Tuning type adjustments" would not be needed since the basic transmitters at these frequencies already exist.

For most Region 2 countries, conforming to the U.S. proposal of frequency separation is a matter of buying the appropriate technology or goods from those countries that are capable of producing. Within Region 2, only the United States and Canada are presently producing spacecraft and spacecraft components. For ground receiving systems, Brazil might have the capability of production in addition to the United States and Canada. Of course, needed items may be procured from Japan or several European countries as well.

If the U.S. proposal is not adopted, other Region 2 countries would remain in essentially the same position with regard to conforming. They would have to buy from the producing nations and companies. It is possible that other Region 2 countries might perceive a lower cost associated with the status quo (i.e., already developed technology). However, this perception would be in error, since the status quo requires the more immediate development of high technology.

Question (11). Does the overall U.S. proposal for the GWARC include frequency allocation plans for future satellite developments, such as multipurpose space platforms? If significant developments are made in satellite technology before the next GWARC in 1999, can a GWARC be convened prior to that time? What would be required for the United States to initiate such a meeting?

Answer (11). Overall the U.S. proposals stress the need for flexibility and incremental change to allow the phasing in of more efficient radio-communication technologies as they develop. Our specific proposals have reflected this approach, both in frequency allocation and in regulatory matters.

Whether a general WARC would be called before the end of the 1990's to deal with the implications of changes in communications technology is a matter of conjecture at the present time. The more probable scenario would be a series of specialized conferences to deal with these changes. There is a set procedure in the ITU Convention for calling such conferences, which the United States could initiate, on its own or with other ITU members as it saw fit.

Question (12). How much input did NASA make to U.S. preparations for WARC? Are there areas in which NASA disputed the recommendations of the Interdepartment Radio Advisory Committee? How were these issues resolved?

Answer (12). NASA has been a full participant to U.S. preparations for WARC for the last five years. It is an IRAC member and NASA officials have been members of our bilateral teams discussing WARC matters with foreign countries. Additionally, NASA spokesmen have presented papers at each of the three ITU regional seminars held in preparation for WARC–79. On one occasion, NASA has disagreed with recommendations of IRAC. This disagreement was resolved in executive sessions involving myself, Henry Geller, Director of NTIA, Charles Ferris, Chairman of FCC, and Robert Frosch, NASA Administrator.

Question (13). What is the U.S. proposal regarding an allocation for satellite power stations? Since you indicated that this is likely to be a controversial topic at the GWARC, do you expect the controversy to be technical or political?

Answer (13). The United States proposes that the band 2450 MHz be designated for a solar power satellite. The controversy will probably be both technical and political. The technical controversy will be over the possible interference which such a system might cause to radio services. The "political" controversy would relate to the possible environmental and biological hazards of the system. These problems are under study by NASA and the Department of Energy and will have to be fully resolved before a system is put into operation. Our objective at WARC is merely to identify an appropriate frequency for the "downlink" of such a system in the event that these problems are resolved and experimental work is able to go forward.

Question (14). Mr. Robinson, could you provide for the record the U.S. position paper for the GWARC?

Answer (14). Because our position papers contain classified negotiating strategy and tactics, I cannot provide a copy of them at this time. I will, however, provide a copy of our official proposals which have been sent to the ITU.

The next witness will be Mr. Neil Hosenball, who is Chairman of the U.S. Delegation to the Untied Nations Committee on the Peaceful Uses of Outer Space.

Mr. Hosenball, it's nice to have you here again.

Mr. HOSENBALL. Thank you, Mr. Chairman.

[The prepared statement of Mr. Hosenball follows:]

STATEMENT OF S. NEIL HOSENBALL, U.S. REPRESENTATIVE TO THE 1979 SESSION AT THE U.N. COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE AND GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. Chairman and members of the subcommittee, I am pleased to have the opportunity to appear as a witness at this hearing in my capacity as U.S. representative to the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and report on the results of the Committee's recent meeting, June 18 through July 13, 1979.

By way of background, the United Nations Ad Hoc Committee on the Peaceful Uses of Outer Space came into being on December 13, 1958, one year after the launch of Sputnik and almost simultaneous with the birth of NASA. A part of its charter was to explore "the nature of legal problems which may arise in the carrying out of programs to explore outer space." One year later, the Ad Hoc Committee was transformed into a standing committee of the United Nations. The Committee initially consisted of representatives from 24 countries, was increased in 1961 to 28, in 1974 to 37, and today, after the addition of 10 new members in 1977, has 47 member nations participating. The member nations on the Committee mirror the U.N. membership as a whole, having African, Asian, Latin American, Western European, Eastern European, Mid East, First World countries, Third World countries, and countries in every stage of development. The Committee established two subcommittees, a Legal Subcommittee and a Scientific and Technical Subcommittee. The Legal Subcommittee holds a four-week session in the spring of each year, and the Scientific and Technical Subcommittee also meets in the spring for a 2- or 3-week session, usually prior to the Legal Subcommittee meeting. Each subcommittee at the conclusion of its session prepares a report to the parent Committee on the Peaceful Uses of Outer Space to be considered during a 2- or 3-week session in late spring or early summer. Similarly, the parent committee at the end of its session issues a report for discussion in the General Assembly's Special Political Committee. The Special Political Committee then drafts a resolution for submission to and subsequent adoption by the General Assembly.

All members of the Committee on the Peaceful Uses of Outer Space are represented on its two subcommittees. Generaly, the delegates to the Legal Subcommittee are lawyers or diplomats, while most delegates to the Scientific and Technical Subcommittee have a scientific or technical background. The Committee and its subcommittees work on the basis of consensus. The alternatives to operating by consensus would be to decide issues by majority vote. The Committee recognized at an early stage of its history that dealing as it would be in an entirely new area of human activity that the most authoritative way of preceeding would be through a common appreciation of the problems and common agreement on its solution. The principle of consensus was adopted as the only acceptable procedure for obtaining workable effective solutions.

Conflicting positions must be resolved by unanimous agreement or, if not unanimous agreement, by the dissenting member noting or reserving its objections or position on the record. Of course, each member State, whether on the Outer Space Committee or not, can later decide if it wishes to become a party to the treaty and be bound by its terms. In general, the Space Treaties have received widespread, though not universal, acceptance by the international community. The Outer Space Treaty, for example, has been signed by 90 countries and ratified by 56.

The consensus principle has worked well to date, and its usefulness was recently reinforced by the approval in the last session of the Committees of the Agreement Governing Activities of States on the Moon and other Celestial Bodies. It has worked notwithstanding that Committee membership consists of countries with differing systems of jurisprudence, political philosophies, social customs, and levels of scientific and economic development. The process has worked probably because nations have perceived, if not a unity of interests, at least roughly parallel interests in securing outer space for the peaceful pursuit of its potential benefit for all nations and mankind.

Well then, what has the Committee and its subsidiary bodies actually accomplished in 20 years? Taking note of the problems and limitations which inhere in its methods of operations and given the fact that this new organization was dealing not only with the new milieu of outer space but a new frontier of law with virtually no precedent, the number of treaties and conventions presently in force dealing with outer space is surprising, especially when one considers the intricacies of international law and diplomacy and the fact that many disparate interests are involved in outer space. In the scientific and technical area, it has fostered international cooperation and provided a framework for the discussion and dissemination of the results of space activities.

The early work of the Committee, although brought to a halt several times as the result of cold-war tensions, eventuated in General Assembly Resolution 1721 (XVI) in December 1961 which commended to States the following guiding principles: (1) that international law, including the Charter of the United Nations, applies in outer space; and (b) that outer space, including celestial bodies, is free for exploration and use by all States in conformity with international law and is not subject to national appropriation. Six years later, these principles became the main pillars of the 1967 Outer Space Treaty.

In the short span from 1958 to 1974, the Legal Subcommittee has produced four space treaties which have entered into force—The 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies; The 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space; The 1972 Convention on International Liability for Damage Caused by Space Objects; and the 1974 Convention on Registration of Objects Launched into Outer Space.

It is generally accepted that the Outer Space Treaty of 1967 is the basic charter or constitution governing space activities. The extensive history behind the Outer Space Treaty can be inferred from the lapse of 6 years from Resolution 1721. The Outer Space Treaty includes Articles establishing a number of basic principles, such as State responsibility for damage caused by the launching of space objects, provision for the rescue and return of astronauts and objects launched into space, and provision for the registration of space objects so as to identify ownership of the object. The three treaties that followed elaborated these basic principles first established in the Outer Space Treaty. Other Articles in the Outer Space Treaty provide that, unlike airspace, outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claims of sovereignty; outer space, including the Moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind; the placing in orbit around the earth, stationary in outer space, or the placement on celestial bodies of any objects carrying nuclear weapons or any other kinds of weapons of mass destruction is proscribed; the Moon and other celestial bodies shall be used exclusively for peaceful purposes; States parties to the Treaty bear international responsibility for national activities including activities of non-governmental entities in outer space, including the Moon and other celestial bodies; and several provisions providing that space activities should be conducted so as to promote international cooperation in the exploration and use of outer space, including the Moon and other celestial bodies.

At its recent 1979 session, the COPUOS reached consensus on a fifth treaty, the Agreement Governing Activities of States on the Moon and Other Celestial Bodies. This treaty, like its three predecessors, is an elaboration of basic principles first established in the 1967 Outer Space Treaty. In 1971, the U.S.S.R. proposed for inclusion in the agenda of the 26th session of the General Assembly an item entitled "Preparation of an international treaty concerning the Moon." On November 5, 1971, at the 26th session of the First Committee of the General Assembly, the U.S.S.R. submitted a "Draft Treaty Concerning the Moon." On November 29, 1971, the General Assembly adopted resolution 2779 (XXVI) in which it took note of the draft treaty submitted by the U.S.S.R. and requested the COPUOS and its Legal Subcommittee to consider, as a matter of priority, the question of the elaboration of a draft international treaty concerning the Moon and to report thereon to the General Assembly at its 27th session.

During the 11th session of the Legal Subcommittee, a substantially revised and expanded text consisting of a Preamble and twenty-one Articles was approved as the basis on which work should be pursued during the following session of the Legal Subcommittee as a matter of priority. In the years following 1972, it soon became apparent that there were only three outstanding issues preventing consensus; the scope of the Treaty, i.e., whether it should be restricted to the Moon or apply to other celestial bodies; information to be furnished; and exploitation of natural resources.

During the 17th session of the Legal Subcommittee (March 13–April 7, 1978), a concerted effort by the Austrian delegation to resolve the outstanding issues through the medium of informal consultations resulted in a draft text of an "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" being submitted to the Legal Subcommittee as a working group paper (WGI 1978) WP 2 (April 3, 1978). Because the draft had been circulated so close to the end of the session, neither the working group, the Legal Subcommittee nor the COPUOS had the opportunity to either review or discuss this draft text. Action on the text was deferred to the 1979 session of the Legal Subcommittee so as to permit review and consideration by the delegates and their respective governments. The informal consultations held during the 1978 Legal Subcommittee and COPUOS sessions concentrated on the natural resources article and, in particular, the inclusion of "the common heritage of mankind" concept, it being informally understood the other outstanding issues of information and scope of treaty could be resolved if the natural resources issues could be successfuly compromised.

During the eighteenth session of the Legal Sucommittee (March 12-April 6, 1979), the Austrian draft text was reviewed and discussed. Brazil, speaking for the developing countries, proposed one amendment to the natural resources article (Article XI) which, if acceptable to the rest of the Legal Subcommittee, would be referred to their Governments for acceptance. It was proposed that the "common heritage of mankind" concept be reformulated to read:

"The moon and its natural resources are the common heritage of mankind, which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article."

This resulted in brackets being placed by other delegations around other provisions, i.e., treaty scope, advance notification of placement of radioactive materials, natural resources exploitation review conference, and ratification.

The COPUOS, at its 1979 session, was able to reach consensus due to the acceptance by the U.S.S.R. of the Brazilian formulation of the "common heritage" principle and the agreement of the developing countries not to insist on a provision imposing a moratorium on the exploitation of natural resources pending the establishment of an international regime to govern such exploitation.

Before discussing in greater depth the natural resources Article XI and some other issues of importance in the Treaty, it is noted that the Treaty adds to or usefully clarifies existing international space law in the following respects:

(a) Article III, paragraph 2—usefully details certain specific prohibitions to ensure peaceful use of the Moon and other celestial bodies.

(b) Article V—provides for notification and specified information upon completion of a mission or, for a mission of long duration, every 30 days; provisions in regard to multiple use of areas or orbits, possible discovery of organic life, and danger to human life.

(c) Article VI, paragraph 2—confirms right of States to collect and remove samples for scientific investigation and the right to use appropriate quantities of substances on the Moon and other celestial bodies to support scientific missions.

(d) Article VII, paragraph 1—environmental protections.

(e) Article VII, paragraph 2—advance notification of radioactive materials use.

(f) Article VII, paragraph 3—reporting of areas of special scientific interest and designation of such areas as international scientific preserves.

(g) Article IX, paragraph 1—principle of using only such area of the Moon and other celestial bodies as is required for the needs of a station.

(h) Article X, paragraph 1—obligation to safeguard human life and to regard all persons on the Moon and other celestial bodies as entitled to Astronaut Agreement treatment.

(i) Article X, paragraph 2—obligation to offer shelter to those in distress.

(j) Article XII, paragraph 3—right to humanitarian emergency use of lunar facilities of others.

(k) Article XIII—notification regarding crash landings.

(l) Article XIV, paragraph 2—recognition that a detailed liability regime may be necessary.

(m) Article XI, paragraph 7—establishment of principles calling for orderly and safe development and rational management of natural resources, expansion of opportunities in use of such resources, equitable sharing in benefits, and special consideration of the interests and needs of developing countries and for the efforts of space powers.

(n) Article XV, paragraphs 2 and 3—detailed provision for effective consultation in disputes situations.

Coming back to the "common heritage of mankind" principle which is enunciated in Article XI, paragraph 1, and is tied to the future international regime that may be established to govern the exploitation of natural resources, it was the United States which introduced this language in 1972. It confirms that all the States parties to the treaty have a sufficient interest in the possible future exploitation of the natural resources of the Moon and other celestial bodies that their views are to be given serious consideration at any future international conference which may attempt to establish an international regime. The United States, in an on-the-record statement by the U.S. Representative at the Legal Subcommittee on May 3, 1972, stated the following:

"On the broadest level of generality, it seems right to state that such resources are of 'the common heritage of all mankind * * *' On the other hand we would not want to preclude in any way the use of natural resources of celestial bodies for scientific investigation; U.S. activities in returning lunar samples and in sharing them with scientific institutions around the world are well known, as are the Soviet Lunokhod returns and exchanges. We would also want to be careful to ensure that celestial body resources may be used where found for supporting life systems as, for example, in uses by astronauts of liquids or gases of a particular celestial body. Finally, we would need to contemplate a special treaty-drafting conference in the event of the discovery of commercially exploitable resources. At such a conference participants would need to bear in mind not only common goals of economic advancement but the need to encourage investment and efficient development as well."

A further explanation of the meaning attached to the "common heritage" principle by the United States was presented to the Legal Subcommittee by the U.S. Representative on April 19, 1973, as follows:

"My delegation wants also to place on record United States views concerning the problem of celestial body natural resources. As we have seen the matter, what is involved is not so much a problem but only a conceivable possibility. Essentially, the question is what rules and procedures should reasonably apply in the event of the future discovery of exploitable natural resources on, for example, the Moon.

"Last spring the United States proposed that, and I quote, 'The natural resources of the Moon and other celestial bodies shall be the common heritage of all mankind.' (A/AC.105/C.2(XI) Working Paper 12/Rec. 1, 17 April 1972.) We also proposed to protect current or possible future uses of these resources for scientific research, such as the return of lunar rocks, for example, the hypothetical use by an astronaut of water or some other liquid found in rocks on a celestial body. In addition, we proposed that if and when practical exploitation of lunar resources should become a reality, the parties to the treaty should join in an international conference, and again I quote, 'with a view to negotiating arrangements for the international sharing of the benefits of such utilization.'

"As far as they go, these proposals have met with very wide acceptance. When there was some reluctance to proclaim the current applicability of the 'common heritage' principle, we agreed that the Moon Treaty might instead put

the matter in a somewhat different context by providing that the purpose of such a future conference should be 'on the basis' of the common heritage principle. On the other hand, as I have at this session repeatedly, although I hope politely, made clear, the United States is not prepared to accept an express or implied prohibition on the exploitation of possible natural resources before the international conference meets and agrees on appropriate machinery and procedures and a treaty containing them takes effect. In our view, the Moon agreement cannot reasonably seek to require that exploitation must await the establishment of the treaty-based regime.

"We have sought to meet concerns of other delegations by accepting the suggestion that the current treaty should call for States conducting missions to the Moon and other celestial bodies to report not only on scientific results but on natural resources. A provision of this character would help ensure that all parties to the treaty would be informed and could take action to prepare for and meet in the international conference.

"One or two particular points should be made concerning these matters as they are reflected in Working Paper 15 which the United States delegation introduced on April 17. As is apparent from the text, this working paper excludes the concept of a pre-regime moratorium. References to the words 'in place' in the first sentence of that paragraph and to paragraph 7 of Article X make this clear. More particularly, the words 'in place' in the first sentence of paragraph 2 are intended to indicate that the prohibition against assertion of property rights would not apply to natural resources once reduced to possession through exploitation either in the pre-regime period or, subject to the rules and procedures that a regime would constitute, following the establishment of the regime. Also with regard to the last sentence of paragraph 2 of Article X, the 'without prejudice' clause would apply to exploitation whether by a State, government entity, non-governmental enterprise or international organization."

These statements by the United States were not contradicted and constitute a part of the legislative history of the treaty negotiations. (The phrase "in place," referred to in the above statement is contained in the first sentence of paragraph 3, Article XI, of the Treaty text.)

On the last day of the 1979 COPUOS session, July 3, 1979, after consensus was reached on the Moon Treaty, I, as the U.S. Representative, made the following statement which was again not contradicted by any of the delegations which spoke subsequently:

"Article XI of the draft Moon agreement, which declares that celestial bodies other than the Earth, and the natural resources of such celestial bodies, are the common heritage of mankind, was initially suggested by Argentina but was formally proposed by my delegation in 1972. It makes clear that the parties to the agreement undertake, as the exploitation of the natural resources of the celestial bodies other than the Earth is about to become feasible, to convene a conference to negotiate an international regime to govern the exploitation of those mineral and other substantive resources which may be found on the surface or subsurface of a celestial body. The draft agreement—and I am particularly pleased about this, as a member of the National Aeronautics and Space Administration (NASA)—as part of the compromises made by many delegations, places no moratorium upon the exploitation of the natural resources on celestial bodies, pending the establishment of an international regime. This permits orderly attempts to establish that such exploitation is in fact feasible and practicable, by making possible experimental beginnings and, then, pilot operations, a process by which we believe we can learn if it will be practicable and feasible to exploit the mineral resources of such celestial bodies. My Government will, when and if these negotiations for such a regime are called for, under Articles XI and XVIII, make every effort to see that the regime is successfully negotiated.

"We note also with satisfaction that Article XI, paragraph 8, by referring to Article VI, paragraph 2, makes it clear that the right to collect samples of natural resources is not infringed upon and that there is no limit upon the right of States parties to utilize, in the course of scientific investigations, such quantities of those natural resources found on celestial bodies as are appropriate for the support of their missions. We believe that this, in combination with the experimental and pilot programmes, will foster and further, and perhaps speed up, the possibility of the commercial or practical exploration of natural resources."

In connection with the "common heritage" principle, the 1979 COPUOS Report will record the Committee's agreement that "by virtue of Article I, paragraph 1, the principle contained in Article XI, paragraph 1, would also apply to celestial

bodies in the solar system other than the Earth and to its natural resources." The plain meaning of this Committee agreement is to limit application of the "common heritage" principle to the celestial bodies themselves and to the natural resources of such celestial bodies. Clearly, there is no intent to apply the principle to orbits and trajectories of space objects. Further, nothing in the text suggests that all countries are to share equally in the Moon's resources. Any sharing of resources would have to be agreed to in an international conference. Article XI, paragraph 7, uses the phrase "equitable," not "equal" sharing. In determining "equitable" sharing, special consideration is to be given not only to the needs and interests of the developing countries but also to "the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon."

Regarding Article I, the 1979 COPUOS report will also record the Committee's agreement that "the trajectories and orbits mentioned in Article I, paragraph 2, do not include trajectories and orbits of space objects in earth orbits only and trajectories of space objects between the earth and such orbits." In my July 3, 1979, statement for the record, I affirmed the U.S. understanding of the Article's meaning as follows:

"We accept the Committee's conclusions as to this Article—namely, first, that references to the Moon are intended to be references also to other celestial bodies, other than the Earth; secondly, that references to the Moon's natural resources are intended to comprehend those natural resources to be found on these celestial bodies; and thirdly, that the trajectories and orbits referred to in Article I, paragraph 2, do not include trajectories and orbits of space objects in Earth orbit only, or trajectories of space objects between the Earth and Earth orbit.

"In regard to the phrase 'Earth orbit only,' the fact that a space object in Earth orbit also is in orbit around the Sun does not bring the space objects which are only in Earth orbit within the scope of this treaty; and a space object orbiting the Moon, while the Moon orbits the Earth as well as the Sun, is in fact within the scope of this treaty."

Moving now to the second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, the Committee agreed that the conference would be held in the latter part of 1982 for a period of two to three weeks and deferred the venue question to 1980. The agenda would permit discussion of "scientific, technical, social, economic, organizational and other relevant aspects and their interrelationships." Attempts to add "legal aspects" were rejected. The Committee also agreed that the consensus procedure is to be included in the Rules of Procedure for the Conference to be established, as follows:

"It is proposed that best endeavors would be made to ensure that the work of the conference and the adoption of its final report would be accomplished by general agreement."

This language is similar to that pursuant to which the COPUOS itself operates by consensus. It was recommended that a conference secretariat be established, headed by a secretary-general and three deputies, as well as a conference bureau headed by a president, several vice presidents and chairmen of the three main committees: (1) State of Space Science and Technology; (2) Applications of Space Science and Technology; and (3) International Cooperation and the Role of the U.N. If the proposed agenda, which was developed in the Scientific and Technical Subcommittee and approved by the full Committee, is adopted by the UN General Assembly, it will be circulated to all member States in January 1980 with an invitation to submit national papers to be reviewed by the conference secretary-general by spring 1981.

The Committee endorsed the recomendations of the Scientific and Technical Subcommittee that the agenda for its 1980 session should include the following priority items:

"(*a*) Consideration of the United Nations Programme on Space Applications and the co-ordination of space activities within the United Nations system;

"(*b*) Questions relating to remote sensing of the Earth by satellites;

"(*c*) Use of nuclear power sources in outer space;

"(*d*) Co-ordinating role of the United Nations in the use of space science technology, particularly in the developing countries.

"With regard to the item on remote sensing, the Subcommittee recommended that its future examination of questions relating to remote sensing also include the specific areas of applications of remote sensing technology so as to enable it to further assess the needs of Member States, particularly the developing countries, in the various areas of current and future applications."

It endorsed the recommendation that the agenda of the Scientific and Technical Subcommittee's seventeenth session should also include the following items:

"(*a*) Questions relating to space transportaiton systems;

"(*b*) Examination of the physical nature and technical attributes of the geostationary orbit."

The Committee further endorsed the Scientific and Technical Subcommittee's recommendation that the Working Group (WG) on Nuclear Power Sources should meet during the session in order to continue its consideration of questions related to the use of nuclear power sources in outer space. The WG has recommended that to assist its future work further studies should be made in the following subject areas:

"(1) Elaboration of an inventory of the Safety problems involved in the use of nuclear power sources in outer space; (2) Implementation of the recommendations of the International Commission on Radiological Protection (ICRP) relating to populations and the environment in the context of space vehicles utilizing nuclear power sources; (3) Evaluation of existing methods for understanding orbital mechanics to determine if improvements may be made in predicting reentry phenomena; (4) Definition of technical considerations with regard to a format for notification."

To this end the U.N. Secretary General has requested member States and international organizations to contribute by September 1979 studies on the technical aspects and safety measures relating to the use of nuclear power sources in outer space, including the above-mentioned aspects identified by the WG as requiring further examination. An informal meeting of technical experts to discuss these papers is expected later this year in preparation for the 1980 Scientific and Technical Subcommittee session.

Regarding the 1980 agenda of the Legal Subcommittee, the Committee recommended that the Legal Subcommittee should continue its work on items relating to:

"(*a*) Legal implications of remote sensing of the Earth from space, with the aim of formulating draft principles;

"(*b*) Elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting, and * * *.

"[(*c*)] * * * as well as on the item on matters relating to the definition and/or delimitation of outer space and outer space activities, bearing in mind, *inter alia*, questions relating to the geostationary orbit * * *. The Committee further recommended that the Legal Subcommittee should continue to include on its agenda an item entitled 'Other matters.'"

The subject of nuclear power sources was added as a separate item to the agenda of the Legal Subcommittee under the title, "Review of existing international law relevant to outer space activities with a view of determining the appropriateness of supplementing such law with provisions relating to the use of nuclear power sources in outer space." In this connection, at the suggestion of the U.S. Representative, the U.N. will request views of States on the question of relevant international law to be submitted by December 15, 1979. The U.N. will circulate such submitted views by February 15, 1980.

As to remote sensing and direct television broadcasting from satellite, the Committee did not go beyond the work accomplished at the 1979 session of the Legal Subcommittee. There are 17 draft principles dealing with remote sensing under discussion in the Legal Subcommittee. Because of the limited time available, I will only discuss those that form the center of controversy.

While much redrafting of the principles remains to be done, there is one unresolved key issue reflected in a number of the draft principles on which a diversity of views still exists despite extensive discussion over the last four or five years. The issue is access to and the dissemination of remote sensing data and/or information derived therefrom. In very early discussions, questions were raised about the right of a sensing State to sense the territory of another State without the latter's prior consent. With more and more States having this capability and recognizing the potential value of this space application, this argument has largely disappeared and in its stead many delegations now seek to impose a prior consent regime on the dissemination of data and/or information. Other delegations, including the United States, support the right of a sensing State or of a receiving ground station State to openly disseminate remote sensing data without the prior consent of the sensed State. The U.S.S.R. has proposed that data having a resolution no better than 50 meters photographic be openly disseminated while data better than 50 meters resolution be subject to the prior consent of the sensed State.

Those delegations desiring a prior consent regime argue that remote sensing data and information derived therefrom have economic, political and national security implications. The U.S. delegation has asked delegates for the past three years to cite a single example where Landsat data has damaged the economic, political or national security interest of any State. None has been forthcoming. There are numerous examples where it has benefited States, particularly the developing countries. Benefits usually have some burdens associated with them. The U.S. believes that Landsat-type systems can continue to provide significant national, regional, and international benefits that far exceed the slight risk of injury to the economic, political or national security of any one or more countries.

In addition, if a prior consent regime were adopted, the international cooperative program under which the Landsat ground stations abroad have come into being would have to be ended since data is not only in the possession of the space segment countries but also in the hands of the ground receiving station countries. In response to the Soviet proposal, the United States and other delegations pointed out that spatial resolution from a technical standpoint was not a reliable or standard reference, a conclusion supported by the Scientific and Technical Subcommittee as well as by COSPAR, the Committee on Space Research of the International Council of Scientific Unions.

Regarding the status of the agenda item on elaboration of draft principles governing the use by States of Artificial Earth Satellites for direct television broadcasting a short explanation of what the principles are intended to cover is required. The principles are intended to apply to satellites which will transmit a TV signal from space directly into a home TV receiver. The technology capable of doing this exists today. Japan with the launch assistance of NASA has deployed such an experimental DBS, and a consortium of Nordic countries is planning one for the early 1980s. In order to receive the TV signal, a dish-type antenna approximately one meter and a converter attached to a standard TV set are necessary. In addition, the antenna has to be accurately pointed at the satellite stationed in geostationary orbit. This item has been on the agenda since 1972 and has been the subject of intense debate since completion of the Registration Convention in 1974. A draft preamble and 12 draft principles have been elaborated, but no consensus has been reached though a great deal of time and effort has been expended looking for a compromise solution.

There are in essence only two issues which appear to be blocking consensus, and it is on these issues that various compromise formulations have been proposed. These issues relate to the formulation of the principle on consultation and agreement between States. Both involve the concept of prior consent. But before discussing the issue, some additional background is needed.

In 1977, a World Administrative Radio Conference was held under the auspices of the I.T.U. and a result of the conference was the adoption of a plan consisting of national assignments of frequencies and orbital slots for direct television satellite broadcasting for Regions 1 and 3, which include the world except for North and South America in Region 2.

It would be a breach of the plan adopted at the 1977 conference for a country thaat has agreed to adhere to the plan to use in Regions 1 and 3 an orbital position or frequency channel not assigned to it in order to broadcast to another country in those regions. The 1977 conference also treated the question of spill-over. Broadcast satellites transmit a wide beam. The beam is shaped by the antennas aboard the spacecraft, but it is impossible to shape the beam to conform with national boundaries and so you have what is called "spillover" into neighboring countries. The 1977 conference established limits on this unavoidable spillover, seeking to reduce it to a minimum.

With this background, I can proceed to the issues. The U.S.S.R. and the Eastern Bloc countries insist, notwithstanding the I.T.U. regulations which because of the need for rational management of the radio frequency have imposed by technical regulations what is in effect a prior consent regime for direct broadcast satellites in Regions 1 and 3, that there ought to be UN/DBS principles which establish politically a requirement that direct broadcast signals cannot cross national borders, whether intentional or unintentional, without the prior consent and agreement of the neighboring State. A large group of delegations would exclude the requirement for prior consent in the case of unintentional spillover but would apply it to the case where a State intends to broadcast its signal into some State other than its own. The United States and a very small number of other delegations view the present language of the proposed principle on consultation and agreements between States as limiting and eroding the

principle of free flow of informatiou, a fundamental human right recognized in such international instruments as the Universal Declaration of Human Rights in Article 19 which declares the right of people "to seek, receive, and impart information and ideas through any media and regardless of frontiers" and reaffirmed in Resolution 33/115 of the General Assembly and most recently in the UNESCO Declaration on the Mass Media. The United States fully supports a principle providing for full consultations prior to the establishment of any international DBS by a State, consultations which could include the subject of program content, but not consultations that must end with an explicit agreement or the prior consent of a receiving station before such broadcasting may begin. The issue is therefore ideological and political and may be difficult to resolve. It remains to be seen whether consensus will ever be reached as long as this issue remains.

On the issue of definition of outer space, the U.S.S.R. introduced at the 1979 COPUOS session a working paper which set forth draft provisions for a UN General Assembly resolution governing both the definition question and the legal status of geostationary satellites' orbital space. Essentially, the Soviets propose: (1) that the region above 100/110 km from sea level is outer space, (2) that space objects of States have the right to fly over the territory of other States at lower altitudes for the purpose of reaching orbit and returning to earth in the launching State's territory, and (3) that the geostationary satellites' orbital space is inseparable from outer space and all relevant provisions of the 1967 Outer Space Treaty are applicable to it, i.e., it is not subject to national appropriation. The equatorial countries reaffirmed their position, claiming sovereignty over the geostationary orbit and calling for a legal regime to be established for the geostationary orbit. While the U.S. agrees with the U.S.S.R. as to its characterization of the geostationary orbit as being part of outer space, the U.S. has expressed the view that definition is not necessary at the present time as no delegation has identified any problem that would be solved by adopting a definition. Further, activities in space have been going on for over 20 years without hindrance or problems caused by lack of a demarcation line. The Scientific and Technical Committee had earlier concluded that there were no scientific or technical characteristics of the earth's upper atmosphere that would be a basis for a definition/delimitation and had requested the Legal Subcommittee to identify problems to be solved by such definition. The U.S. also noted that COSPAR in one of its reports indicated that past estimates of the lowest altitude at which satellites had survived had been too high, and this argues against adopting an arbitrary altitude at this time. I note that at this point no drafting of either principles or a Treaty document on these matters has started.

We do not believe that there is a need to add a codicil to the 1967 Outer Space Treaty since it is absolutely clear that under that Treaty the geostationary orbit is in outer space and is not subject to national appropriation by any means. This is the position of the United States, U.S.S.R., and the overwhelming majority of member States of the Committee on the Peaceful Uses of Outer Space.

As reviewed above, it appears that the 1980 sessions of the COPUOS and its two subcommittees will be dealing with a number of important issues that are difficult to resolve. However, the history of the COPUOS demonstrates that it is a dynamic body with an enviable record of achievement, and there is no reason not to expect that the Committee on the Peaceful Uses of Outer Space will not move forward on the matters under consideration.

Thank you.

STATEMENT OF S. NEIL HOSENBALL, CHAIRMAN, U.S. DELEGATION TO THE UNITED NATIONS COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE

Mr. HOSENBALL. I appreciate the opportunity to appear before this subcommittee to report on what has been accomplished by and what is currently pending before the United Nations Committee on the Peaceful Uses of Outer Space. In my prepared statement I have addressed in detail the organization and history of this committee, its past accomplishments, the results of its 1979 meetings, and the agenda for its future work. Since that statement, Mr. Chairman, is quite

lengthy, I would, if I might, like to have it incorporated into the record and not read it in full, but just highlight some things that may be of interest to the committee.

In this statement I will attempt to summarize and highlight the material which may be of specific interest to this subcommittee and in particular to address two of the eight issues selected for detailed consideration by the panel of experts who appeared before this subcommittee last May and which appears in the report of this subcommittee, titled "International Space Activities."

The establishment of a United Nations ad hoc committee on the Peaceful Uses of Outer Space in December of 1958 followed the launch of Sputnik a year earlier and occurred only a month after NASA was officially designated as the U.S. civilian space agency. One year later, this ad hoc committee became a standing committee of the United Nations. The committee's two principal functions were basically to facilitate international cooperation in the exploration and use of outer space and to provide an international forum for consultation and agreement respecting international problems that might arise out of outer space activities.

From an initial membership of 24 states, it has doubled in size to a current membership of 47, with the largest increase, the addition of 19 states, having occurred within the last 5 years. The membership on this committee is equitably distributed among and is generally representative of the various regional groups that make up the United Nations. These recent increases in membership evidence the ever growing international interest in the purposes for which outer space is explored and used and in the achievement of an orderly basis for the conduct of space activities. It also demonstrates that many nations are eager to participate directly through international cooperation in various aspects of outer space in such applications as those involved in scientific research, weather forecasting, communications, and remote sensing.

The committee has two subcommittees, a Scientific and Technical subcommittee and a Legal Subcommittee. The members of the committee and its two subcommittees meet yearly in separate sequential sessions during the spring and early summer for a total of from 8 to 10 weeks, depending upon their agenda. The committee has a permanent U.N. staff in the Outer Space Division of the U.N. Secretariat, which includes a space application expert whose prime role is to facilitate the exchange of scientific and technical information among member states of the United Nations and, in particular, to assist the developing countries so that they may become familiar with and participate in space applications that can serve their special interests and needs.

The committee and its two subcommittees have during the 20 years of their existence fulfilled their roles as originally conceived. The Scientific and Technical Subcommittee has fostered the exchange of scientific and technical information and has provided a framework for the discussion of the results of space activities. The Legal Subcommittee has provided a forum for consultation and subsequent agreement, having produced in the short span of 20 years four space treaties and last July reaching a consensus on a fifth. The four treaties which have entered into force are the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer

Space, including the Moon and Other Celestial Bodies: the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts, and Return of Objects Launched into Outer Space; The 1972 Convention on International Liability for Damage Caused by Space Objects; and the 1974 Convention on Registration of Objects Launched into Outer Space. The fifth treaty, titled "Agreement Governing Activities of States on the Moon and Other Celestial Bodies," will be forwarded to the Special Political Committee of the United Nations General Assembly which will draft a resolution to be submitted to the General Assembly. If adopted by the General Assembly, the treaty will be commended to member states for signature and ratification. My prepared statement is intended to inform this subcommittee of the content of this new international space instrument and, if signed by the President, it will, of course, be subject to hearings in the Senate as part of the ratification process.

Last June in the international space activities report of this subcommittee, two issues were raised by the panel of experts concerning discussions that were taking place in the Committee on the Peaceful Uses of Outer Space. They were sovereignty over the geostationary orbit and a then proposed United Nations Conference on Outer Space.

Let me first address the sovereignty over the geostationary orbit, which Professor Robinson discussed as well in his statement. Within the U.N. Committee on the Peaceful Uses of Outer Space and its two subcommittees, several equatorial states have asserted that segments of the geostationary orbit are subject to the sovereignty of the underlying states located on the equator. The argument made in support of the claims of sovereignty over the geostationary orbit by the equatorial states is based upon the assertion that the geostationary orbit is not part of "outer space," because the existence of the orbit depends exclusively upon the gravitational phenomena caused by the territory of the underlying states. Such an argument has no scientific or technical basis. The geostationary orbit is but one of an infinite number of orbits into which satellites can be placed, and its particular characteristics are functions of both the total gravitational field of the Earth and the rotation of the whole Earth.

There is no relationship between the geostationary orbit and any underlying country. Entry into the geostationary orbit can be achieved through launch from any country on Earth, though energy requirements for insertion into the geostationary orbit vary with payload mass and the latitude of launch, among other factors. The orbit is completely unaffected by national boundaries on Earth, and satellites require adjustment maneuvers to maintain a steady geostationary orbit. Further, the geostationary orbit is roughly 35,000 kilometers above the Earth's surface, far beyond the altitudes of most satellites currently in Earth orbit. GSO's were understood and utilized before and during the negotiation of the 1967 Outer Space Treaty, and there is no basis in law for treating the GSO differently than any other Earth orbit. The provisions of article II of the 1967 Outer Space Treaty preclude any claims of national sovereignty over geostationary orbits or portions thereof. We, therefore, see no technical or legal basis for considering the GSO's not to be in outer space and, therefore, they are not subject to claims of sovereignty by any state. Apart from the equatorial states, the claim of sovereignty has not received the support

of the majority of the members of the U.S. Committee on the Peaceful Uses of Outer Space. For all these reasons, I must disagree with the recommendation of the panel of experts that "action should be initiated and vigorously pursued to establish an international codicil to the 1967 Outer Space Treaty which specifically forbids any individual nation's claiming sovereignty over the geostationary orbit" since such a codicil is unnecessary as the legal status of the GSO is well established both by treaty and customary international law.

Further, there is no reason to believe that the equatorial states would become signatories to such a codicil and abate their claims of sovereignty over such orbits. The second recommendation of the panel is a far better solution; that is, to seek ways of reducing through technological developments and improvements the demand for geostationary locations so as to meet the future needs of the international community, and in particular of the developing countries, including, if feasible, the development of multipurpose space platforms.

On the second issue of the second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, the panel strongly endorsed the holding of such a conference but recommended that the Conference be limited "to technical matters, especially in the areas of systems capabilities and user applications." The Committee on the Peaceful Uses of Outer Space at its recently completed 1979 session agreed a conference would be held in the latter part of 1982 for a period of 2 or 3 weeks. The location of the Conference would be held was deferred to the next session of the Committee. The Committee recommended an organizational structure, a budget ceiling, and an agenda for the Conference. The agenda would permit discussion of "scientific, technical, social, economic, organizational, and other relevant aspects and their interrelationships."

A concerted effort was made by several delegations to add "legal aspects" to the above, but they were persuaded to withdraw their proposal. "Legal aspects" would change the character of the Conference from a scientifically and technically oriented meeting to one of political debate, thus frustrating the major purpose for which the Conference was designed. Now, whether we will be successful in doing so, as Professor Robinson indicated, discussions, we think, of that nature will take place but we hope that they can be contained, based on the agenda.

The agenda developed by the Scientific and Technical Subcommittee was approved by the committee, and subjects are grouped under three main headings: "State of Space Science and Technology," "Applications of Space Science and Technology," and "International Cooperation and the Role of the United Nations." With your permission, I would like to submit for the record the proposed agenda for the 1982 Conference.

Mr. FUQUA. Without objection, we'll make that part of the record.

[The agenda for the 1982 conference is as follows:]

AGENDA

(1) The Conference agenda should be broad enough to meet the objectives recommended by the Scientific and Technical Sub-Committee at its last session (A/AC.105/216, paras. 98–110) and endorsed by the Committee at its twenty-first session (A/33/20, para. 75);

(2) Under these broad guidelines, the agenda should include the following items:

(A) STATE OF SPACE SCIENCE AND TECHNOLOGY

(i) Review and projection of the current and future state of science and technology for space research and applications;
(ii) Evaluation of the major developments in space science, technology and application and assessment of the usefulness of these developments so far.

(B) APPLICATIONS OF SPACE SCIENCE AND TECHNOLOGY

(i) Evaluation of the current and potential applications of space technology, taking into account present and foreseeable programmes, national and international, in areas of space research;
(ii) Examination of the possibilities and mechanisms for enabling all States to benfit from space technology, bearing in mind their various levels of development, varying capacities to absorb new technologies and particular needs and prioroities;
(iii) Examination of the choices for utilizing space technology available to countries at various stages of technological growth and of the difficulties they face in this regard;
(iv) Examination of the existing infrastructure and scientific and technological development in various countries, especially the developing countries, and of appropriate measures to augment their capabilities to develop space technology and facilitate access to such technology and to participate and co-operate in space activities so as to derive and maximize benfit from space technology and its applications;
(v) Examination of developments and system configurations appropriate to the use of space technology for education;
(vi) Discussion of compatibility and complementarity between various satellite systems, including those used for remote sensing, meteorology, communications and navigation;
(vii) Cosideration of the implications of projected developments in the areas of space technology such as earth orbiting solar power stations, space manufacturing, space transportation and manned space stations; consideration of the implications of the use of the geostationary orbit, the need and possibilities for optimizing that use, as well as of the measures to be taken to that end;
(viii) Discussion of the nature of, and ways of protecting, the near-earth environment including the upper atmosphere and magnetosphere.

(C) INTERNATIONAL CO-OPERATION AND THE ROLE OF THE UNITED NATIONS

(i) Consideraion of reports on the nature and extent of the bilateral and multilateral co-operation in outer space activities;
(ii) Consideration of reports on the activities of the United Nations and other international organizations dealing with the exploration and peaceful uses of outer space;
(iii) Evaluation of the role of the United Nations, its specialized agencies, other international organizations and programmes of bilateral and multilateral co-operation in order to ensure broad international co-operation on an equal basis;
(iv) Evaluation of the role of the United Nations in the realization of benefits of space technology for all countries and examination of the need and possibilities for enhancing this role.

Mr. HOSENBALL. Before concluding these remarks, let me outline the agenda for next year's meetings of the subcommittees of the United Nations Committee on the Peaceful Uses of Outer Space. Both the Scientific and Technical Subcommittee and the Legal Subcommittee continue their discussions on remote sensing, use of nuclear power sources in space, and the geostationary orbit. The Scientific and Technical Subcommittee in addition will consider the United Nations program on Space applications, the coordinating role of the United Nations of space activities within the total United Nations system, and the United Nations' role in coordinating the use of space science tech-

nology, particularly in the developing countries. The Scientific and Technical Subcommittee also will be examining questions relating to space transportation systems.

In addition to the three items previously mentioned, the Legal Subcommittee will continue its work on developing principles for international direct broadcast satellites and continue its discussion of the definition/delimitation of outer space.

Mr. Chairman and members of the subcommittee, I would conclude my remarks by noting that interagency cooperation on United Nations space matters during the 10 years that I have served as a member of the delegation has been excellent. The Department of State, NASA, the Department of Defense and, when required, the Departments of Energy and Commerce and the Federal Communications Commission have provided representatives and advisers to the delegation to assure that agency programs and interests are fully considered and taken into account in preparation for the discussions and negotiations at committee and subcommittee sessions.

That completes my statement, Mr. Chairman.

Thank you and members of the subcommittee.

Mr. FUQUA. Thank you very much, Mr. Hosenball.

In your statement you submitted for the record you refer to the Moon Treaty. You did not refer to it in your summary statement.

Is it your opinion whether or not the Moon Treaty places any limitation on the exploration for natural resources by any government or private entity?

Mr. HOSENBALL. It is my opinion, and I think a review of the total record of the negotiations over the 7 years will clearly establish, that it does not place any moratorium or limitation on the commercial exploitation of the lunar surfaces or celestial body resources and that there is nothing in the treaty that in any way restricts that activity being carried out by industry, by private commercial entities.

Mr. FUQUA. Even in the definition of the "common heritage for mankind" language, in some of the interpretations that is being given today?

Mr. HOSENBALL. Although everybody relates it to the Law of the Sea negotiations, the common heritage of mankind is in fact, as Professor Robinson mentioned, in the Mass Media Declaration. If you read the Mass Media Declaration of last year, you will find that culture is a common heritage of mankind and is so contained in that Mass Media Declaration.

I think common heritage has to be defined in any treaty itself. It is a word that is used by the developing country. It does have a connotation to them, one which we accept but in the sense of sharing but rather of recognizing what we see as legitimate concerning of developing countries in resources and other aspects, both in space and on the ground.

The Moon Treaty does contain an article which talks in terms of equity, not in terms of sharing lunar resources. The treaty does provide that a conference will be called if and when exploitation became commercially feasible. That would, of course, really mean that you would be very far downstream in getting the information to make that determination.

There is nothing, of course, in the Moon Treaty that binds us to anything in any follow-on conference, and the world, I think, may be a lot different when exploitation is proven feasible on a commercial scale, and that common heritage may mean something completely different then. I don't think that it is a defined term, and I think people are overly concerned with the definition. The definition in the Law of the Sea is being hammered out in the implementation of the exploitation of natural resources. I think the treaty—and I've tried to set it out in my prepared statement—does contain some very positive things. For example, there would have been a question without this treaty whether there was any right to exploit natural resources at all, whether you could gain ownership and control over natural resources.

I think that issue is clarified in this treaty because we talk of natural resources inplace. You cannot get sovereignty over natural resources inplace, for once you removed them you have the hight to own them and use them. That's just one example.

I think it also ought to be remembered that we are in an organization that has 47 members and that treaty negotiations are among all 47. Also remember that we have other space powers, notably the Soviet Union, who also have an active development program in space.

What is binding on us in this treaty would equally be binding on them, and we see some significant advantages of other provisions in the agreement which the Soviet Union, if they become parties to this agreement, will have to comply with.

Of course, the President has not signed the treaty yet. It still is subject to his signature. I could, of course, say that we were instructed, based on interagency reviews, not to block consensus. In other words, when the other countries, including the Soviet Union, finally reached an agreement on the treaty and the language, we did not block consensus. We did make several statements on the record. We did get several specific agreements in the report where there was some question of ambiguity, but on the whole, as I mentioned, we'll have to wait until the Senate hearings and the President's signature and probably go into it more deeply then.

Mr. FUQUA. There is then a definition of common heritage contained in the treaty?

Mr. HOSENBALL. There is no definition of common heritage contained in the treaty as such.

Mr. FUQUA. As agreed to, as an addendum to the treaty?

Mr. HOSENBALL. No.

Mr. FUQUA. Or a memorandum of understanding?

Mr. HOSENBALL. No. There is no definition of common heritage in the Moon Treaty as such.

Mr. FUQUA. I thought I understood you to say that there needs to be a definition.

Mr. HOSENBALL. No. I think it would be impossible to come up with a definition in a space context. Unlike the Law of the Sea, where we do have some information on the investment required; where we do have technology and facilities, boats, and what have you, that can harvest the resources on the bottom of the sea. We're a long way from that, I think, in space activities. We don't know what it would cost, whether in fact it will require extensive international participaton to

mount that kind of effort. We even don't know at this stage whether it would be fruitful to do so. So I think it doesn't, and it should not, have a definition at this time. I don't think we know enough in a space context to try to define it.

Mr. FUQUA. You mentioned in your summary statement about the Panel on International Space Activities concerning the U.N. Conference on the Exploration and Peaceful Uses of Outer Space that it should be limited, and I quote, "to technical matters, especially in the areas of systems capabilities and user applications."

To what extent is the agenda, or agreed to agenda, inconsistent with this recommendation?

Mr. HOSENBALL. It is not at all, sir. I believe it is totally consistent with that recommendation.

Mr. FUQUA. We have a vote.

George, do you have some questions you want to ask?

Mr. BROWN. No. Thank you.

Mr. FUQUA. Thank you very much, Mr. Hosenball. We may have some written questions to submit to you.

[Questions and answers for the record follow:]

RESPONSES TO GENERAL QUESTIONS FROM THE SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS HEARINGS ON INTERNATIONAL SPACE ACTIVITIES; NEIL HOSENBALL

Question 1. In contrast to some nations, the United States has traditionally promoted the concept of free dissemination of data in its earth resources satellite programs. If the United States establishes an operational earth resources satellite system, it will presumably be based on this concept. What effect will the establishment of such a system have on negotiations within the U.N. to arrive at an international agreement regarding remote sensing? Will the United States continue to promote the principle of free dissemination of data? What is the status of U.N. deliberations regarding a remote sensing agreement—what principles have been agreed upon and what are the remaining areas of disagreement?

Answer. As stated on page 18 of my prepared statement, in the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and its two subcommittees, the United States supports the right of a sensing State or of a receiving ground station State to openly disseminate remote sensing data without the prior consent of the sensed State. The establishment of an operational earth resources satellite system would not affect the U.S. position noted above in the COPUOS negotiations for drafting remote sensing principles, but could add a sense of urgency to the debate.

As of the conclusion of the 1979 session of the COPUOS, its Legal Subcommittee has formulated 17 draft principles. However, no consensus has been reached on the main principles which deal with the key issue of access to and the dissemination of remote sensing data and/or information derived therefrom. Additionally, there are reservations of some degree noted by different countries on every one of the 17 draft principles under discussion.

Question 2. Several nations are funding efforts to develop the technology which will enable satellites to broadcast directly to home receivers. What is the status of U.N. deliberations regarding an agreement on direct broadcast satellites?

Answer. Regarding the elaboration of draft principles governing the use by States of artificial earth satellites for direct television broadcasting, as stated on page 19 of my prepared statement, a draft preamble and twelve draft principles have been formulated by the Legal Subcommittee, but no consensus has been reached. In essence, two issues appear to be blocking consensus. Both of these issues involve the concept of prior consent, i.e., (1) whether the prior consent of the receiving state is necessary before the broadcasting country could directly broadcast into the receiving State and (2) whether the prior consent of a State which receives unintentional spillover of direct broadcast signals would be necessary. While the U.S. fully supports a principle providing for full consultations prior to the establishment of any international direct

broadcasting system by any State, the U.S. opposes consultations that must end with an explicit agreement or the prior consent of a receiving state before such broadcasting may begin. Since the issues are ideological and political and may be difficult to resolve, it remains to be seen when consensus will be reached as long as these issues remain.

Question 3. The House Science and Technology Committee's panel on international space activities recommended that there be a U.N. Conference on Outer Space but that it be limited to technical matters. Do the majority of the members of COPUOS believe that such a conference should be so limited? Does the U.S. have an official position on this?

What action is the U.S. taking to ensure that our delegation will be sufficiently funded and prepared to advance through exhibits and other information material, the contributions the U.S. has made in space applications and in particular the benefits which are available to less developed nations?

Answer. It is the U.S. position that the Second U.N. Conference on the Exploration and Peaceful Uses of Outer Space be limited to technical matters. There was a concerted effort by several delegations, as I noted on page 9 in my September 6, 1979 summary statement, to add "legal aspects" to the agenda which would permit discussion of "scientific, technical, social, economic, organizational and other relevant aspects and their interrelationships." However, these delegations withdrew their proposal in the face of arguments that such an addition would change the character of the conference from a scientific and technically oriented meeting to one of political debate, thus possibly frustrating the major purpose for which the conference was designed.

Since the holding of such a conference was just recently recommended to the U.N. General Assembly and establishment of the conference venue is still pending, no actions are as yet under way with respect to funding for and preparation of the U.S. delegation. After approval of the General Assembly, steps will be taken to fund and prepare the U.S. delegation.

Question 4. Would you comment on the panel's first recommendation that no individual nation should be able to claim sovereignty over the geo-stationary orbit?

Answer. We agree that no individual nation should be able to claim sovereignty over the geostationary orbit (GSO). I, however, disagree with the panel recommendation regarding an international codicil to the 1967 Outer Space Treaty. Such a codicil is unnecessary because the legal status of the GSO is well established both by treaty and customary international law.

Question 5. Concepts being discussed in the U.S. today concerning extended manned presence in space call for mining of the mineral resources of the moon and asteroids. Is the exploitation of the Moon and asteroids essential to the U.S. future space program? If so, how would such utilization be viewed by those nations which believe that the Moon is the property of all mankind and that no one nation has the right to its resources?

Answer. Certainly, in the future, the use of mineral resources of the Moon and other celestial bodies could be important to the U.S. Space Program, if and when the U.S. is ready to establish space stations or installations on celestial bodies and such exploitation proves feasible and economical. Within the context of the Moon Treaty reported out by the COPUOS, such utilization is entirely proper.

Question 6. Do COPUOS member nations believe that the U.N. Convention on Registration of Space Objects, ratified recently, has had a positive effect on reporting procedures for space flight?

Answer. The Convention on Registration of Objects Launched into Outer Space is viewed as a positive step forward in the formulation of space law.

It was the non-space powers in COPUOS including the developing countries which proposed converting the voluntary registration system then in effect into a Treaty obligation. I am unaware of any member nation of COPUOS expressing concern about compliance with its provision.

Question 7. Mr. Hosenball, does the Moon Treaty place any limitations on the exploitation of natural resources by any government or private entity?

Do you believe there is any uncertainty or ambiguity in the language of the Moon Treaty which could inhibit commercial investment on the basis of vague or inconsistent terms of intent of the parties?

Could you further elaborate this point and identify any possible limitations imposed by the Moon Treaty?

Answer. The Moon Treaty does not place limitations beyond those in the 1967 Outer Space Treaty on the exploitation of natural resources by any government or private entity, except that the "activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 [Article XI]" and the environmental protections set forth in Article VII, both of which provisions were originally proposed in early 1970's by the U.S.

I do not believe that the Moon Treaty language, by itself, should inhibit commercial investment. The article of the Moon Treaty most relevant, Article XI, makes clear that all States parties to the treaty have a sufficient interest in the possible future exploitation of the natural resources of the Moon and other celestial bodies that their views are to be given serious consideration at any future international conference which may attempt to establish an international regime. Any such regime would have to give special consideration not only to the needs and interests of the developing countries but also to "the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon."

Any possible limitations contained in the Moon Treaty must be viewed in the context of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies which provides in (1) Article I that "The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind" and "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all states without discrimination of any kind, on a basis of equality . . . and there shall be free access to all areas of celestial bodies." (2) Article II that "Outer space, including the moon and other celestial bodies is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means," (3) Article VI that "The activities of non-governmental entities in outer space, including the moon and other celestial bodies, shall require authorization and continuing supervision by the appropriate State Party to the treaty" and (4) Article IX that "In the exploration and use of outer space, including the moon and other celestial bodies, States Parties to the Treaty shall be guided by the principle of co-operation and mutual assistance and shall conduct all their activities in outer space, including the moon and other celestial bodies, with due regard to the corresponding interests of all other States Parties to the Treaty . . ." and "so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose."

Question 8. You state on page 12: ". . . places no moratorium upon the exploitation of the natural resources on celestial bodies, pending the establishment of an international regime."

Do you believe this places any obligation on the part of the U.S. to negotiate a future "international regime" on the basis of "Common Heritage"?

Answer. The U.S., if the Moon Treaty is signed by the U.S. and the Senate gives its advice and consent, would be under an obligation to participate in the international conference, which would be called under specified circumstances, to establish the international regime. The main purposes of such a future international regime would be based on Article XI, paragraph 7 of the Moon Treaty. Nothing in the Moon Treaty obligates any State Party to accept the negotiated regime. State Parties are only obligated to negotiate in good faith.

Question 9. Does the Moon Treaty actually defer any agreement on use or limitations on use of lunar materials until some future treaty is agreed to which is referred to as an "international regime" in Article XI?

Could you further expound on what actions or limitations are imposed until such a future "international regime" is established?

Answer. The Moon Treaty does not contain any limitations on use of lunar materials except as noted above in response to question 7. Quite the contrary, the right to use and/or remove mineral substances is explicitly recognized and permitted in the Moon Treaty, and the Moon Treaty does not place limitations on exploitation of natural resources once they are physically separated from the surface or subsurface of the moon for use on the moon or elsewhere in space

or for return to earth. The non-ownership of natural resources provision applies only to resources still in place, before such separation.

Question 10. Mr. Hosenball, you stated that the U.S. delegation was instructed not to block the consensus on the Moon Treaty. Could you elaborate on this and indicate how far the U.S. would have gone to ensure consensus?

From what level of government did the instruction come?

Answer. The U.S. delegation, as is apparent from the fact consensus was reached, was instructed not to block consensus on the text of the Moon Treaty put forth by the Australians, as amended in the 1979 session of the Legal Subcommittee, if it appears that the rest of the COPUOS could accept this text. The instructions came from the Department of State and resulted from consultations with interested agencies.

Question 11. Mr. Hosenball, since the Moon Treaty does not appear to affect the relatively broad provisions of the 1967 Outer Space Treaty in substance, are there any political or other considerations which prompted U.S. support of the Treaty in COPUOS?

Answer. At the conclusion of negotiations, the U.S. indicated the test as it then stood was acceptable. The U.S. did not actively promote or oppose the Moon Treaty in the COPUOS. The U.S. decision to accept the Treaty was based on the view that the text does add to or usefully clarifies existing international space law as stated on pages 7 and 8 of my prepared statement.

Question 12. Have other member nations attempted to limit the scope of "Common Heritage of Mankind" as it applies to the Moon Treaty: What are their positions on its meaning and affects on future space activities?

Answer. In 1973, the U.S.S.R. and Argentina submitted working papers on the question of the "common heritage of all mankind" concept as it was formulated in that time period without the qualifying phrase "which finds its expression in the provisions of this Agreement and in particular in paragraph 5 of this article." The U.S.S.R. was of the opinion that the common heritage phrase was meaningless because the moon and other celestial bodies, in accordance with the 1967 Outer Space Treaty, are not subject to national appropriation. Therefore, "a thing that belongs to nobody cannot pass into any person's possession by succession." Argentina was of the opinion that the phrase was a replacement for the vague expression "province of all mankind" and was a realization by States that they are entitled to the benefits derived from principles and norms established for outer space and celestial bodies within a specified legal framework. The 1972 and 1973 U.S. statements, which to the best of my knowledge were made uncontradicted, on this concept are found on pages 9 through 11 of my prepared statement.

We have not had the opportunity to review the summary or verbatim records for the entire period 1972 through 1977 to ascertain if statements were made on this matter by other delegations.

We'll take a short recess and vote, and then hear from our distinguished and able colleague from Louisiana.

[Whereupon, the subcommittee was in recess from 11:38 a.m. until 12:10 p.m.]

Mr. FLIPPO. The subcommittee will be in order.

I believe at this time we would like to hear from Mr. Leigh Ratiner representing the L–5 Society. Mr. Breaux was scheduled to testify at this time, and I think he will be joining us shortly. But if you would, we would like to receive your testimony now, and then we'll hear from Mr. Breaux.

Mr. RATINER. Thank you very much, Mr. Chairman.

[The prepared statement of Mr. Ratiner follows:]

STATEMENT OF LEIGH S. RATINER, ON BEHALF OF THE L–5 SOCIETY

INTRODUCTION

Mr. Chairman, I am grateful that your Subcommittee has provided me with the opportunity to testify today on the implications for the United States of the draft agreement governing the activities of states on the moon. Negotiations have been underway in the United Nations for a number of years on this draft

treaty. They have just concluded, and the UN General Assembly has been asked to open the treaty for signature in a few weeks. I appear before you today to warn that, if the moon treaty is signed and ratified by the United States, it will foreclose the commercial uses of outer space by American private enterprise.

Since I have not previously had the privilege of appearing before this Subcommittee, I would like to take a moment to introduce the organization I represent and to tell you a little about my own background and experience. I appear before this Subcommittee on behalf of the L–5 Society, a non-profit association of some 3,500 private citizens who are devoted to the advancement of mankind's full utilization of the potential of space. Our members reside in every state in the U.S. and in a number of foreign countries. They are committed to do everything they can to preserve this nation's options to move our industrial creativity and inventiveness into outer space.

In the years to come, human beings will travel, live and work in outer space. On a small scale, human beings already do this. With the advent of the space shuttle, it will be done on a larger scale. This will be followed by multiple space shuttles and eventually by orbiting work platforms, which will became a base for space manufacturing. No one knows better the promise of outer space than the members of this Subcommittee. I will, therefore, avoid repeating to you a catalog of the industrial developments now underway or considered feasible by respected scientists during the next few decades. One need only be a casual reader of the daily newspaper to know that space may in the next few decades by the location for major industrial activities which could produce substantial portions of the world's energy requirements.

I am a partner in the Washington law firm of Dickstein, Shapiro & Morin. My practice concentrates in the field of international law and natural resources. My clients include corporations both large and small, domestic and foreign, as well as one foreign government. All have an interest in the discovery and development of basic raw materials and natural resources. Before entering private practice, I was an American Government official for fifteen years. In that capacity, I served a number of federal agencies including the Department of the Interior and the Federal Energy Office and was responsible in those agencies for international resource problems. From 1969 to 1977 I was a member of the American Delegation to the law of the Sea Conference and during that time was for four years the principal American negotiator for the resources of the deep seabed. It is in part because of this experience at the Law of the Sea Conference that the L–5 Society asked me to appear before you today on their behalf and share with you some thoughts on the recently concluded moon treaty, with particular regard to its relationship to the law of the sea treaty which may itself be concluded next year after eleven years of negotiation. That treaty, Mr. Chairman, gives us the roadmap to the meaning and interpretation which the moon treaty will have, should it ever become the law of the land.

Mr. Chairman, the draft moon treaty uses as its legal precedent the 1970 UN Declaration of Principles on the Seabed and Ocean Floor Beyond the Limits of National Jurisdiction which declared the resources of that area to be the "common heritage of all mankind." If we are to fully understand that concept, which I will explain in detail a little later in my testimony, we must first understand the historical context in which it arose and how it fits into a complex international negotiating scenario which is now sweeping through all UN bodies and conferences concerned with economics.

THE MODERN HISTORICAL CONTEXT FOR "COMMON HERITAGE"

Mr. Chairman, the moon treaty proposes to govern all the resources of the moon and all other celestial bodies. Can we even contemplate the quantity and quality of all the natural resources in our solar system? Since the industrial revolution mankind has been forced to remove from the earth an enormous quantity of resources in order to sustain industrial development. Indeed the space age is itself a product of our ability to utilize natural resources for progressive industrialization. Wars have been fought and countries colonized over virtually insignificant resources compared to those which will be found beyond our earth. One marvels at the arrogance of those who would even feel qualified to subject such vastness beyond our understanding and reach to an elaborate legal regime governing future generations' needs and patterns of growth.

While only a small number of the nations on earth are now fully industrialized states, the common objective of virtually all the rest is industrialization. Almost every diplomatic move being made in multilateral negotiations at the UN now

relates to the need to assist the developing countries in the process of industrialization. Where are these resources to come from? No one can say for sure that they will come from outer space, but who can say they will not. Indeed, twenty years ago no one dreamed that a significant share of the world's nickel, cobalt, and manganese would by the turn of the century be retrieved from 15,000 feet below the deepest parts of the world's oceans.

Mr. Chairman, the development of natural resources only requires a market, a technology and a suitable cost of extraction compared to alternative sources of raw materials. I have just described to you global demands for industrialization and, accordingly, an unprecedented expansion of the market. The technology for this development of natural resources in outer space is well on the way. After all, a large part of the technological progress has already been successfully accomplished by mankind's proven ability to get there, to work there and to live there. History proves that the costs of alternative sources of raw materials continues to rise steadily, thus stimulating the production of new sources of raw materials.

THE POLITICAL CONTEXT IN WHICH COMMON HERITAGE MUST BE UNDERSTOOD

In the last ten years there has been an extraordinary change in the world—one to which many of us have perhaps been too close to fully understand. There are approximately 90 countries in the world today which did not exist in the 1950's. They are virtually all poor. Almost all of them were colonies before their independence. In their struggle to obtain independence, they found in many cases that while they were free, they were worse off economically than they had been before. Rather than renounce their new-found freedom, they have sought to act collectively to strengthen their bargaining position with the industrialized countries of the world. This began to occur in the early 1970's and is still occurring. The process gained in intensity when, in 1973, OPEC demonstrated its ability to cause, through concerted political and economic action, a massive transfer of wealth from the rich countries to the poor. During that same period the developing countries of the world formed a political caucus known as the Group of 77, which began to formulate common positions on all of the economic subjects which found their way into the UN negotiating system. The Group of 77 in the early and mid-1970's developed a manifesto for this emerging revolution in international affairs. They prepared a declaration calling for the creation of a New International Economic Order. The underlying rationale of that document is the assertion that fundamental justice requires that those who receive the raw materials and natural resources which fuel and feed industrialized economies must be required to pay a significant share of their economic wealth in exchange for access to those resources. The so-called North-South dialogue is a direct-out-growth of that declaration. Third World enthusiasm for this new movement caused the spread of this new ideology to every available forum in the United Nations. These concepts have now been deployed in the UN Conference on Science and Technology, at the Law of the Sea Conference, in the North-South dialogue, in the outer space negotiations, and are even under discussion with respect to the use of natural resources of Antarctica.

The principle of the Common Heritage, inserted into the political arena at the Law of the Sea Conference, was chosen as the first available slogan for the concrete elaboration of these principles at a law-making conference. At that conference, two-thirds of the earth's surface is to be the subject of a treaty that will govern the rights of all states and human beings on, over and under the world's oceans. Nationalism and economic need quickly lopped off the most immediately available and useful resources before that conference could internationalize them. During the protracted negotiations at the Law of the Sea Conference, most countries unilaterally claimed jurisdiction over as much of the oil and fishery resources adjacent to their coasts as they could possibly justify.

Thus, the playing out of the New International Economic Order was restricted to the deepest ocean beds, where valuable but futuristic resources were known to exist.

When the law of the sea negotiations began in the late 1960's with the negotiation and adoption in 1970 by the UN General Assembly of a Declaration of Principles, there was no technology for extraction of these resources. Today only 10 years later, four major international consortia have announced their complete confidence in the technology which they have developed for the extraction of these resources within the next several years. However, they have all an-

nounced as well that, under the treaty which is emerging at the UN, they cannot conceive of continuing with their investments. Many doubt that the law of the sea treaty will ever be ratified by the United States because it is an elaboration of the Declaration of Principles first adopted by the UN in the 1970's. Private enterprise shudders at the thought of investing $1 billion for a single seabed mining operation under the politico-economic philosophy which has been elaborated under the common heritage banner.

THE MEANING OF THE COMMON HERITAGE—THE MOON TREATY AND THE LAW OF THE SEA COMPARED

Mr. Chairman, over 150 nations have just spent 10 years in arduous negotiations developing a draft treaty which is intended to define the principle first adopted by the UN General Assembly in 1970 that the resources lying at the bottom of the ocean are "the common heritage of mankind." That principle is now so well defined in international custom and practice that it is possible to predict with certainty how the resources of the deep seabed will be developed—if at all. It is equally possible to predict the legal content of a regime for the resources of outer space, if that regime is to be founded on the same common heritage principle. Later in my statement I will describe fully to you what that principle means.

The moon treaty in most important respects corresponds to the 1970 UN Declaration of Principles on the deep seabed. Articles IV and XI of that treaty provide as follows:[1]

ARTICLE IV

1. The exploration and use of the moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. Due regard shall be paid to the interests of present and future generations as well as to the need to promote higher standards of living conditions of economic and social progress and development in accordance with the Charter of the United Nations.

2. States Parties shall be guided by the principle of cooperation and mutual assistance in all their activities concerning the exploration and use of the moon. International co-operation in pursuance of this Agreement should be as wide as possible and may take place on a multilateral basis, on a bilateral basis, or through international intergovernmental organizations.

ARTICLE XI

1. The moon and its natural resources are the common heritage of mankind which finds its expression in the provisions of this agreement and in particular in paragraph 5 of this article.

2. The moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by any other means.

3. Neither the surface nor subsurface of the moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity or any natural person. The placement of personnel, space vehicles, equipment facilities, stations and installations on or below the surface of the moon, including structures connected with their surface or subsurface, shall not create a right of ownership over the surface or the subsurface of the moon or any areas thereof. The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.

4. States Parties have the right to exploration and use of the moon without discrimination of any kind on a basis of equality, and in accordance with international law and the terms of ths Agreement.

5. States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible. This provision shall be implemented in accordance with article XVIII of this Agreement.

[1] Underscoring indicates the principal catch-phrases which have been elaborated in detail at the Law of the Sea Conference and which are derived from the 1970 Declaration of Principles pursuant to which the law of the sea treaty has been negotiated.

6. In order to facilitate the establishment of the international regime referred to in paragraph 5 of this article, State Parties shall inform the Secretary-General of the United Nations as well as the public and the international scientific community to the greatest extent feasible and practicable of any natural resources they may discover on the moon.

7. The main purposes of the international regime to be established shall include:

(a) The orderly and safe development of the natural resources of the moon;

(b) The rational management of those resources;

(c) The expansion of opportunities in the use of those resources; and

(d) An equitable sharing by all States Parties in the benefits derived from those resources, whereby the interests and needs of the developing countries as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the moon shall be given special consideration.

8. All the activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 of this article and the provisions of article VI, paragraph 2, of this Agreement.

Mr. Chairman, I offer for the record the UN Declaration of Principles on the Peaceful Uses of the Seabed and Ocean Floor Beyond the Limits of National Jurisdiction. You will find that those principles and the principles enunciated in Article XI are virtually twins. Like the UN Declaration of Principles for the deep seabed, the moon treaty calls for a subsequent negotiation. Article XI, paragraph 5, of the moon treaty commits the parties "to establish an international regime, including appropriate procedures to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible." In short, Mr. Chairman, commercial exploitation of the resources of our solar system must await a new international agreement that will elaborate in detail this draft moon treaty, in the same way that the law of the sea treaty elaborates the 1970 Declaration of Principles for the deep seabed.

It is therefore incumbent on all of us to scrutinize with the utmost care how the principle that resources are the common heritage of mankind has been interpreted in the law of the sea treaty to determine whether the U.S. should now sign a treaty on the moon that contains a significant risk that all of the natural resources of our solar system will be subject to the same international regime as is being contemplated for the bottom of the oceans.

Mr. Chairman, allow me to summarize the major provisions of Part XI of the draft law of the sea treaty. In doing so, I will indicate which provisions of the law of the sea treaty are derived from principles now found in Article IV and Article XI of the moon treaty.

First, exploration for and exploitation of seabed resources are under the complete control of an international organization. This provision of the law of the sea treaty is deemed by most of the world to derive from the principle that the resources of the seabed are the common heritage of all mankind—a phrase which is believed by the vast majority of nations to mean common property. Indeed, in several of the official languages of the UN the term used to translate heritage is "patrimony"—the legal equivalent of property in most of the world.

The concept is also derived from the provision of Article IV, paragraph 1, of the moon treaty which requires that exploration and use of the moon "shall be carried out for the benefit and in the interest of all countries." Article XI, paragraph 4, provides that the right of exploration and use of the moon shall be "without discrimination of any kind." Thus, the argument runs that, if the resources belong to all nations, they can only be disposed of through common consent, which can only be found in an international organization comprised of all countries.

Such an organization is in any event argued to be necessary to ensure fidelity to the principle of non-discrimination. More important, however, the moon treaty, like the 1970 Declaration of Principles for the Deep Seabed, specifically provides for a particular kind of discrimination which shall be permissible.[2] Article IV of the moon treaty makes clear that in the exploration and use of the moon "[d]ue regard shall be paid . . . to the need to promote higher standards of living conditions of economic and social progress and development. . . ." Arti-

[2] Indeed, the law of the sea treaty now expressly permits discrimination in favor of developing countries as provided for in the treaty.

cle XI, paragraph 7, subparagraph (c) and (d), establish that among the main purposes of the international regime shall be "expansion of opportunities in the use of those resources" and an "equitable sharing by all states parties in the benefits derived from the resources, whereby the interests and needs of the developing countries . . . shall be given special consideration." These concepts of special discrimination for developing countries will require a special type of international organization in which all important decisions are taken by governing bodies in which developing countries have the greatest influence. In the Law of the Sea Conference, these same concepts have been translated into an international organization that is dominated by a powerful, general Assembly that operates on a one-nation-one-vote principle. That general Assembly is considered to be supreme among the organs of the Seabed Authority, is empowered to make general policies, and approves the rules and regulations of the Seabed Authority which govern resource exploration and exploitation. All other organs of the Seabed Authority (including its executive council, which is supposed to have more balance between the industrialized countries and the developing countries) are required to follow the Assembly's general policy guidance. The creation of this suprational governing authority is expressly contemplated in Article XI, paragraph 5, of the moon agreement in the seemingly innocuous phrase: "States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures. . . ."

Second, following on the principles described previously, no nation is guaranteed a seat on the executive council of the Seabed Authority, even though a handful of countries possess the technology to develop the resources.

Third, the policy decisions and discretionary acts of the Seabed Authority (and virtually all important decisions are discretionary) are not subject to impartial judicial review in the international court established by the law of the sea treaty. The reasoning which leads to this result is that the common heritage of mankind must be disposed of in accordance with the will of mankind. Since the one-nation-one-vote Assembly is the manifestation of that will, it cannot be second-guessed by a small, select panel of judges. In short, when the treaty says the Assembly is supreme, it means business.

Fourth, no state nor any of the citizens of any state has the right of access to explore or exploit the resources, except as accorded by the Seabed Authority and subject to such terms and conditions as it may lay down. Again, the principle of the common heritage, it is thought by most, cannot be fairly implemented if any state has automatic access to the resources which are owned in common by all countries. This is buttressed by Article XI, paragraph 3, of the moon treaty, which says that no part of the natural resources in place shall become anyone's property. In short, title to the resources can only be given by the new organization which owns the resources on behalf of all mankind. This result is exactly how those same principles were spelled out in the law of the sea treaty.

Fifth, the law of the sea treaty contains elaborate provisions for the regulation and control of production of the natural resources of the seabed and severely limits the amount of natural resources which can be brought to the market, regardless of actual market conditions or consumer needs. This provision of the law of the sea treaty was derived at first from a preambular paragraph in the 1970 Declaration of Principles which called for respect for the interests of developing countries who may possess the same minerals on land as would come from the seabed. The industrialized countries argued, however, in the negotiation of the treaty that they were not bound to follow the guidance of the preambular paragraphs of the Declaration of Principles. Accordingly, Third World negotiators changed the justification for seabed production controls, which is now derived from operative paragraphs of the Declaration of Principles also contained in Article XI of the moon treaty as among the main purposes of the new moon resources treaty. Article XI, paragraph 7(b), states that one of the main purposes of the international regime is the "rational management of those resources." Paragraph 7(a) of the same article calls for "orderly and safe development of the natural resources of the moon." These two phrases turned out to be the principal phrases which were used to justify control of seabed production at the Law of the Sea Conference. "Orderly development" is generally thought to suggest economic controls for the purpose of conservation. "Rational management" is a code word for centrally planned production policies. Mr. Chairman, it is no accident that these two phrases were elevated to the status of "main purposes" of the new moon resource regime.

Sixth, the law of the sea treaty creates as an arm of the Seabed Authority an inter-state mining company called the Enterprise. The original intention of

the developing countries, doggedly pursued for many years in the Law of the Sea Conference, was to have the Enterprise be the sole authority in the world entitled to develop and market the resources of the deep seabed. Once the deep seabed was supplying a significant share of the world's nickel and other metals, the Enterprise would have acquired power quite similar to the power of OPEC with respect to oil.

On this issue, the industrialized countries drew the line. They would not accept an international operating monopoly as the proper meaning of the common heritage principle. Instead, they proposed a so-called parallel system of development in which states and their nationals could have access to the resources and so could the Enterprise. During the last three years of negotiation, however, this so-called parallel system was so tortured in the negotiating of its detailed provisions that it is now clear that it is a euphemism for a system which creates an international monopoly Enterprise. For example, the treaty now provides that:

(*a*) There will be tax incentives for anyone who joins with the Enterprise to carry out development.

(*b*) In order to acquire the direct right to explore and exploit, a state or mining company must explore two mine-sites of equivalent value—one to be selected by the Authority and given to the Enterprise.

(*c*) All technology for the development of the resources of the deep seabed must be transferred to the Seabed Authority for use by the Enterprise. Indeed, a proposed operator must even obtain the permission of his sub-contractors to transfer their technology to the Seabed Authority, if he is to have and maintain operating rights. The mandatory transfer of technology principle was derived from the principle now found in Article XI, paragraph 7, of the moon treaty calling for "equitable sharing" of benefits whereby the interests and needs of developing countries shall be given special consideration.

(*d*) In case there are competing applications (and because of production controls this is assured, since the number of available mine-sites each year is strictly limited), the treaty through its permissible discrimination in favor of developing countries allows the Authority to make its selection on the basis of which application benefits developing countries the most. Again, we see the special discrimination in favor of developing countries.

In short, Mr. Chairman, even the so-called parallel system of access is so structured in the interest of full implementation of the common heritage principle and the principle which permits discrimination in favor of developing countries that no sane investor with billions of dollars at risk could do other than take the Enterprise as his partner and locate the means of production in a developing country. This is all the most true since the Enterprise is immune from state and international taxation. (Indeed, its early development efforts are to be subsidized by grants and loan guarantees by states parties, thus making available to its potential partners lower interest rates.)

Seventh, even though the law of the sea treaty is tilted so as to cause the natural growth of a monopoly Enterprise, the developing countries insisted that this method of disposing of the resources should be restricted to the first 25 years of the treaty's operation. The parallel system, it was believed, was inconsistent with the common heritage but could be accepted on a temporary basis so as to begin its development process and enable the Enterprise to take over. At the end of that time, the treaty empowers the one-nation-one-vote Assembly to prohibit mining by states and private mining companies, but to allow the continuation of mining by the Enterprise.

Eighth, the Seabed Authority is given the power to impose a system of international taxation on any state or company which explores for or exploits the resources. This system of taxation is designed to ensure the "equitable" sharing of benefits.

Ninth, the apparently innocuous phrase found in Article XI, paragraph 7(c), that one of the main purposes of the international regime shall include "the expansion of opportunities in the use of those resources" has been used at the Law of the Sea Conference to justify a so-called quota or anti-monopoly system in which any nation's access to the resources, if it gets access at all, is limited by the relative access of other countries. If one country is deemed to have an excessive share of the available production, access shall be denied its nationals until other countries—including developing countries—catch up. It is unlikely, when this system is superimposed on the control of production system, that the U.S. will ever be entitled to more than one or two of the production mine-sites in the deep seabed.

Tenth, Mr. Chairman, the provisions of Article XI, paragraph 8, of the moon agreement are of incredible importance, not just to the development of the resources of the moon and other celestial bodies but to the basic right of the United States to decide how to govern its citizens when they are in space vehicles which fly our flag. That paragraph is a grant of authority to a new space resource agency to be created under paragraph 5 to control and regulate all activities with respect to the natural resources in a manner compatible with the purposes spelled out in paragraph 7. These same concepts in the law of the sea treaty fundamentally impair the ability of the flag state to control its own citizens when aboard a vehicle which is carrying out resource-related activities.

One can hardly imagine the ramification of this paragraph when a single world agency takes control of all the people who will one day work and live in space and have anything to do with the resources of the moon and other celestial bodies.

CAN THE LAW OF THE SEA MODEL BE JUSTIFIED FOR OUTER SPACE?

Mr. Chairman, the U.S. uses approximately one-fifth of the world's natural resources. Yet it is on the verge of agreeing to a treaty on the law of the sea which places one of the earth's most plentiful resources under the system I have described above, a system that forever requires American consumers to import their raw materials from an organization under the control of developing counties. Members of this Subcommittee who are not overly familiar with the law of the sea negotiations may be startled by my statement today. It will seem unbelievable that the U.S. would be willing as one of the only nations in the world with the technology to develop these resources to place them under a system of international socialism and out of the reach of American technology. What international interest, you may ask, justifies this wholesale giveaway of access to vital minerals. The answer, Mr. Chairman, is rooted in national security considerations. The U.S. has watched with anxiety over the last 15 years as nations have reached out into the oceans to claim vast expanses of water under their jurisdiction, including a few international straits. The developing countries were prepared to memorialize in the law of the sea treaty the right of freedom of navigation for surface vessels and submarines in exchange for American and other industrialized country recognition of the principle of common heritage as it applies to seabed resources. The present American negotiations seem willing to make that trade. Mr. Chairman, no such justification can be given for the moon treaty, because the 1967 Outer Space Treaty already guarantees freedom of navigation for our space craft and prohibits extension of territorial claims to outer space. The moon treaty is a giveaway of unprecedented proportions for which the U.S. obtains nothing in return.

Mr. Chairman, I do not know of any past or present government official who has been concerned with the law of the sea negotiations who believes that the law of the sea treaty would be in the interest of the United States, if it were restricted to that part of the treaty which deals with the resources of the deep seabed. I would urge the Committee to hear further from responsible Americans who have been connected with the law of the sea treaty. I am certain that all would share my view that the seabed portions of the treaty, by itself without any other provisions on freedom of navigation which benefit the U.S., would be against this nation's best interests. I am equally confident that they would share my view that the 10 years of negotiating history spelling out international consensus of the meaning of common heritage could not be avoided in any new resource negotiation which attempted to use the same principle. Indeed, Mr. Chairman, if the law of the sea treaty does enter into force, approximately 120 developing countries will have every incentive to ensure that the common heritage doctrine is not watered down in any other treaty negotiation.

THE MOON TREATY IMPOSES A MORATORIUM ON COMMERCIAL EXPLORATION

Mr. Chairman, the Administration will argue that the moon treaty does not deter private enterprise and certainly does not impose a moratorium on commercial exploitation. I strongly disagree on both counts. You will recall that the moon treaty calls for a subsequent treaty when exploitation of the resources of our solar system "is about to become feasible." Mr. Chairman, exploitation will never be "about to become feasible" through the efforts of private enterprise, if the moon treaty is allowed to become the law of the land.

The development of natural resources is a long and expensive process and normally goes through certain chronological stages. First, there is the period of

scientific investigation in which private companies in their own laboratories study and extrapolate assumptions about the resources which have been retrieved by scientists and governments. Second, if they have found scientific samples to be of interest, they may begin to develop inexpensive methods of resource sampling so as to gain a clearer picture of the quality, quantity and distribution of possible resource deposits. Should this activity, which is frequently called prospecting, be fruitful they will at that point, and sometimes even earlier, enter the phase of exploration. At the beginning of exploration the economic feasibility, technological feasibility and marketing considerations are studied. These are fairly general studies, since they occur a decade or more in advance of commercialization. During this period, they may build prototype technology to help test their technological assumptions and better define an ore body. While throughout there first three stages they will try to minimize costs in view of the high degree of speculation involved, they may spend tens and perhaps hundreds of millions of dollars. These three phases must all precede exploitation. In an area that requires new technology and highly speculative predictions about future markets, it is impossible for a public corporation to also take the risk that at the end of a 15 or 20 year period of such significant capital spending for R. & D., it will be politically impossible to enter the exploitation or commercial recovery phase of their activity.

Mr. Chairman, we are all familiar with the current thinking that solar power satellites may at least in part be built from raw materials found in outer space. What company could seriously begin to develop solar power technology which would be dependent on mining the mineral resources of the moon if, just as the technology is proved feasible, the U.S. is bound by a treaty to enter into negotiations which may over another period of 10 or more years lead to a treaty anything like the law of the sea treaty? In short, Mr. Chairman, it is my very strong view that the moon treaty in its present form imposes a de facto moratorium on private enterprise use of order space in connection with the development of natural resources.

This treaty does not foreclose the possibility that governments (with private company sub-contractors whose losses are underwritten by the taxpayers) may one day wish to develop the technology under a centrally planned, internationally controlled economic system. What it does do, however, is doom free enterprise initiative in outer space. And it does so at a time when a very long period of government subsidy of the space program may at least be sufficient to spark private initiative. It is hard to believe that Congress has spent tens of billions developing this country's space technology without the expectation that some day our traditional private enterprise system would be in a position to take over. The moon treaty precludes this possibility.

Mr. Chairman, it should also be noted that not only as a practical matter, but also as a legal matter, the moon treaty can be deemed to be a moratorium. The American Delegate in the Outer Space Legal Subcommittee in an effort to make clear that this moon treaty could not be construed as a moratorium, compounded the problem when he said:

"I am particularly pleased [that the draft agreement] places no moratorium upon the exploration of the natural resources on celestial bodies, pending the establishment of an international regime. This permits orderly attempts to establish that such exploration is in fact feasible and practicable, by making possible experimental beginnings, and, then, pilot operations, a process by which we believe we can learn if it will be practicable and feasible to exploit the mineral resources of such celestial bodies."

Can there be any doubt, Mr. Chairman, that the American delegate has made it clear by his statement that the treaty does not permit exploitaion itself?

Mr. Chairman, the Administration may also argue that the view I have expressed today, which I am sure will be shared by many witnesses if you decide to hold broader hearings on this subject, could be wrong in the context of the outer space negotiations. This may be the only argument they can make to justify what they have done.

But, Mr. Chairman, over 150 countries, ours included, have just spent 10 years negotiating a hundred treaty articles with thousands of pages of written records and it all says that there is a global consensus on the meaning of the term "common heritage." I submit Mr. Chairman, that outer space cannot escape that net. But—even if there was a chance that outer space negotiators could rewrite all that diplomatic and legal history—this nation cannot afford to take the very substantial risk that they will fail.

Mr. Chairman, my testimony today represents the beginning of what may turn out to be a long struggle with the Administration. Congress has had virtually no opportunity to learn about the moon treaty and to consider its long-term implications for the future of man's productive activity in outer space. The L–5 Society will make every effort to bring this issue to the attention of every member of Congress and to the American people. We have no doubt that once the Administration's action is understood and publicized, the Congress will be inundated by mail in opposition to this treaty. The American people will not want to give up the hopes and aspirations for America's future in space—their sense of national achievement and accomplishment. I believe that an important part of our national psyche and feeling of self-worth in this generation comes from our proven ability to conquer outer space, and it will not easily be taken away from us.

Mr. Chairman, this treaty has been under negotiation for several years, and those negotiations have now concluded. The UN Committee on the Peaceful Uses of Outer Space has laid the treaty before the UN General Assembly and asked that at its next session, which begins in two weeks, the treaty be opened for signature. We ask that you and your colleagues do everything in your power to convince President Carter to instruct his Delegation to the United States General Assembly to oppose the opening of this treaty for signature and to recommit the treaty for further study. It is a principle of international law that, once a treaty is signed, nations are bound to act in such a manner as is not incompatible with the treaty they have signed. Thus, the mere act of a signature has important legal attributes.

For our part, we will now turn our attention urgently to the Senate and particularly to the Senate Foreign Relations Committee. We hope that before the UN General Assembly convenes in a few weeks the Carter Administration will be advised in no uncertain terms by influential members of Congress that this treaty must be given the most careful study in Congress, by both the Foreign Affairs Committees as well as the Space Oversight Subcommittees.

Mr. Chairman, I greatly appreciate your willingness to hear our testimony today. I hope we have successfully conveyed to you both our sense of alarm and urgency. We stand ready to assist you in any way possible in the further congressional review and oversight of the provisions of this treaty and its impact on our nation.

STATEMENT OF LEIGH S. RATINER, ON BEHALF OF THE L–5 SOCIETY; ACCOMPANIED BY KEITH HENSEN, MEMBER OF THE BOARD OF DIRECTORS, THE L–5 SOCIETY

Mr. RATINER. Mr. Chairman, I am accompanied today by Keith Hensen, who is a member of the Board of Directors of the L–5 Society and one of its founders.

Mr. FUQUA. We're very glad to have you.

Please proceed.

Mr. RATINER. Mr. Chairman, the L–5 Society is a group of some 3,500 American citizens, a nonprofit group, which is really dedicated to the cause of advancing man's utilization of space. It is not a society funded by or supported by any major industrial concern or group. It is basically private citizens who really care.

Mr. Chairman, the Moon Treaty referred to by Mr. Hosenball today is not an isolated occurrence. In order to fully appreciate what this Moon Treaty does, it is essential to look at the last 10 or 15 years of history of the United Nations. I have referred to that in detail in my prepared statement which I offer you for the record, but I would like to summarize briefly that history.

It has only been since the late 1960's that roughly 90 of the developing countries—there are now about 120 developing countries in the world—became sovereign states, and when they did become sovereign states, they found that there were economic jeopardies attached to be-

ing free. They no longer had mother countries to provide for their economies. Freedom tasted very good, and all of them opted to remain free and not go back under the wing of the mother country. But they had economic problems of gargantuan proportions, and understandably, in the early 1970's, they began to realize that only through concerted political action in the United Nations could they begin to acquire the strength—the voice, if you will—that traditionally had been held by the western industrialized countries and by the socialist countries (for example, in the United Nations Security Council).

In 1973, when OPEC taught the whole world a lesson about what collective power can do with respect to the transfer of wealth from the wealthy to the poor, it gave this growing developing country movement in the United Nations tremendous impetus to really begin a rallying cry for the transfer of wealth from industrialized countries to developing countries.

Now, that rallying cry took many different forms in the United Nations organizations where developing countries were represented through this coalition (which came to be called the group of 77, because when the developing countries formed that coalition there were 77; today there are 120).

The Group of 77 in the United Nations developed a manifesto called the New International Economic Order. It is a charter that if I can summarize it—perhaps unfairly, because it's a very long and very complex document—essentially says that those in this world who use the raw materials from those who supply them are going to have to pay for those raw materials dearly.

The New International Economic Order then spread out. Developing country representatives in every different United Nations forum where an opportunity arose adopted that declaration and began to try to proselytize its main features and principles. At that time, the only active conference going on in the United Nations which was preparing a treaty, that is, a law-making document, was the Law of the Sea Conference. That conference is still going on.

Mr. Chairman, at that time I was the principal American negotiator at the Law of the Sea Conference for the mineral resources of the deep seabed, and it was in this conference that the term "Common Heritage of Mankind" first originated. The term, "Common Heritage," was first used in a document which commanded worldwide consensus in 1970, although it had been talked about for several years before. It was even then a member of the American Delegation, although not a negotiator on mineral resources. At that time, I worked for the Department of Defense.

The Defense Department's involvement should tell you a great deal about why the United States, recognizing the vagueness of the common heritage principle and the potential for abuse in the spelling out or elaborating of what that principle would mean, accepted it. It was accepted because, at the Law of the Sea Conference, the developing countries were in a position to agree on a new treaty on the law of the sea recognizing the freedom of navigation for military vessels on the high seas.

I was taken aback—but perhaps it's *deja vu*—by something Mr. Hosenball said earlier when he referred to the position of some developing equatorial countries on the geosynchronous stationary orbit. In

that connection, there was laughter in the room when he described the position of some developing countries with respect to their right to claim sovereignty in the geosynchronous stationary orbit. He said—

> There is, in our opinion, no technical or legal basis for sovereign claims such as those, and we are supported by a majority of the members of the Committee on the Peaceful Uses of Outer Space.

Mr. Chairman, the identical situation and the identical American position existed throughout the 1950's, when some of those same countries who are now claiming sovereignty in outer space declared themselves to have the right to own the ocean 200 miles from their coast. There were only three of them in 1952—Peru, Chile, and Ecuador—in the Declaration of Santiago. They were laughed at, too, by people who sat in the audience in congressional hearings, for having made a ridiculous and legally and technically unsupportable claim to what everyone knew to be the free domain of all countries.

Today, Mr. Chairman, as I'm sure you know, most of the world claims 200 miles of ocean adjacent to its coast, including the United States. So much for whether or not we had the majority view only 15 years ago. We did have the majority view.

Mr. Chairman, the developing countries offered the United States an opportunity to win back what they had begun to lose through these extensions of territorial and resource jurisdiction in the oceans. They would agree in a treaty that there was freedom of navigation for military aircraft and vessels, and particularly for submerged vessels like Polaris submarines going through international straits secretly and unobserved, in exchange for which the United States and other industrialized countries would have to agree to the principle of common heritage of mankind being applied to the deep seabed's resources.

For right or wrong, that was a decision that the United States decided to take. We agreed to trade a negotiation on common heritage for guaranteed freedom of navigation at the Law of the Sea Conference and in the Law of the Sea Treaty. The remainder of the negotiations in the Law of the Sea Conference, having won that point, was really to spell out what was meant by Common Heritage. Now, Common Heritage was a developing country originated doctrine. As it turned out, it's been copied by American negotiators in the Outer Space Committee and actually introduced by the United States. But it began as a developing country concept, and it had one very clear meaning, one that has now taken on, at the minimum, the status of international practice, if not international law.

Mr. Chairman, I am about to say something on the record of this subcommittee which, if I didn't think this treaty could be stopped in the Senate, I would not say because it will make for a damning legislative history after I've said it. But Common Heritage means common property to 90 percent of the people in the nations of this world. It means that you cannot take the resources without the consent of all other mankind. It means that title to the resources is held by mankind and that title to the resources can only be disposed of through a newly created organization which will hold title in trust and then dispense that title according to its own rules, regulations, and resources.

Now, the United States takes the view that common heritage doesn't mean that. That's the official position of the United States. Nevertheless, you will find—particularly if this subcommittee goes beyond this

hearing on the subject today and broadens the witness list to include people who are recognized experts in this field, both in international law and in the law of the sea—that it is very difficult today to argue that common heritage does not mean common property.

Indeed, one technical point I ought to make is that, in Spanish and French and some of the other official languages of the United Nations, common heritage translated is common patrimony, which is the legal term for property in the civil law system. The United States accepts all of the official languages of the United Nations and, therefore, is equally bound by any of them.

Now, the United States took the position throughout this law of the sea negotiation that common heritage would only be defined and understood and elaborated by the terms and provisions of the treaty to which it would agree. It felt almost 10 years ago that the Declaration of Principles in 1970, which declared the resources of the seabed to be the common heritage of mankind, had no real legal significance.

The United States then negotiated for 10 years, bearing in mind that its military interests were being held hostage in these negotiations. My testimony tells you in detail what the Law of the Sea Conference has done to the term "common heritage," and I would like very briefly to summarize that.

Under the principle of common heritage the international community, acting through a newly created international organization, essentially owns the resources of two-thirds of the Earth's surface. No state and no private person has access to those resources. You may ask: Why not? The answer is very simple. If you could have access, then it would be impossible to obtain common consent before you used the resources; and therefore your right of access may exist in principle, but you'd better go to mankind's spokesman, the International Seabed Authority, to determine whether or not you can actually have access and use those resources.

Then the question at the Law of the Sea Conference became: Under what conditions can you obtain access to the resources and what do some of the terms mean that are used both in that declaration of principles on the law of the sea and aslo now in the Moon Treaty. For example, what does it mean when you talk about the enhancement of opportunities of other states to engage in resource activity? What does it mean when you talk about the equitable sharing of benefits among all states and parties?

Let me tell you what it means. In a treaty which the United States is on the verge of signing in the Law of the Sea Conference, "equitable sharing of benefits" is interpreted by virtually all the world today to mean the mandatory transfer of all technology concerned with deepsea mining to an international operating enterprise; that is, an interstate mining company, which is an arm of the International Seabed Authority, dominated and controlled by developing countries throughout its political system. The enterprise would operate in theory in competition with private enterprise from sovereign states, if private enterprise could get access to the resources. But one of the conditions of access would be that a private company must turn over its technology to that competitor, the enterprise. The enterprise under the Law of the Sea Treaty is given so many tax benefits and other built-in discriminatory advantages that it is inconceivable that any

private operator could afford to do business in the seabed, if he could get access, unless he joined with the enterprise in a joint venture of some kind.

So, the entire system is now structured in such a way to ensure that the enterprise, after a period of a few years, will be an international monopoly enterprise.

In the deep seabed, Mr. Chairman, we are only talking about nickel, copper, cobalt, and manganese. They happen to be vital minerals. They happen to be minerals, three of which the United States imports more than 90 percent of its primary consumption. The United States has no domestic sources of supply of nickel, cobalt, and manganese. You don't make steel without manganese, for example. Manganese is known to exist in plentiful quantity only in South Africa and the Soviet Union. But nevertheless, pursuant to the common heritage doctrine and the way it's been spelled out over ten years of negotiation, hundreds of treaty articles, and thousands of pages of written record saying what this doctrine means, the United States is literally on the verge of agreeing to a treaty which has this effect.

Another phrase in the Moon Treaty, "enhancement of opportunities for all states," what that means in the Law of the Sea Conference and what it will mean anywhere else that phrase is used, because of this immense history, is a so-called quota or antimonopoly system to insure that all other states have these opportunities in the future.

Developing countries argue that they don't have the technology or the capability to mine the oceans today. There are 120 of them. They are a majority of mankind. Therefore, it is essential from their viewpoint that the opportunity to mine be reserved for them, since that's the only way that you can enhance their opportunities. The result is that, in the Law of the Sea Conference, there is now a quota system in which the United States will be lucky to get one or two mine sites under its own flag in what is two-thirds of the Earth's surface The United States is a country which is one of a handful that has the technology to mine the resources in the deep seabed, but under the phrase, "enhancement of opportunities," as it is defined and interpreted by the developing countries, with the acquiescence of the United States because of its military interests elsewhere in the treaty, the United States is essentially limiting its access to those vital minerals to a handful, if it gets access at all.

Mr. Chairman, I could perhaps, since I've spent so many years of my life on this subject, go on all day giving you examples of what has happened to the doctrine, common heritage. Indeed, we will undoubtedly be doing that in the coming weeks, because we are facing a very urgent problem.

What we are faced with is a treaty on the Moon that is about to be opened for signature by the United Nations. At least the Law of the Sea Treaty is a year or more away. This is a treaty which the United States has already agreed to.

I was, frankly, shocked when Mr. Hosenball testified before this subcommittee that he had instructions not to obstruct consensus. That's a nice way of putting it. The fact of the matter is, consensus, the rule of consensus in the United Nations, gives the United States a veto. In short, we could have stopped the Moon Treaty dead in its tracks and simply refused to do so, so as not to obstruct consensus.

Now we're in a situation where that treaty goes to the United Nations and will be opened for signature. If it is signed by the United States, there are other rules of international law which require that the United States, having signed a treaty, take no action incompatible with that treaty.

That treaty, Mr. Chairman, despite Mr. Hosenball's testimony to the contrary, creates a moratorium on the exploitation of the resources of outer space. It does so in both practical and legal terms.

As a practical matter, can you conceive of a company spending $10, $50, $100, $200 million on R. & D. in the next 5, 6, 8, 10, 15 years, only to be faced with the prospect that, when it proves that commercial exploitation is possible, the United States will then begin to negotiate a treaty which provides for the exploitation of those resources pursuant to principles already established in the Moon Treaty—principles which have a precedent in international custom and practice to the effect that the company will probably never be able to have access to those resources or a return on its capital investment? It is inconceivable.

Now, in the oceans, companies were already caught. They had started making their investments, and the result was that they went along under promises by the United States that the worst features of common heritage would never come to pass. Everybody understood where it was all leading, but the industry was told, "We will never accept X, Y and Z"—most of the things I just outlined to you as already having been accepted by the United States. So, the industry was caught in a trap.

The space industry is not caught in that trap. They will never invest a dollar if the regime of law to be applied is the common heritage of mankind, followed after their R. & D. with another treaty which is going to look anything like the Law of the Sea Treaty. It's not conceivable.

What may happen for those who are looking for an easy out is that sovereign states may still be willing to invest in the commercial/industrial uses of outer space, and they may subcontract with private companies. So private enterprise isn't necessarily written out in the system. It just has to come under the flag of a sovereign state which, in turn, operates in essentially a planned economy, since this is what common heritage is all about, an essentially planned international economic model.

These companies, of course, will have to have cost-plus arrangements with the U.S. Government to operate in a system like that. The result is that, if you have space industrialization, you will have it on a totally subsidized basis by the American taxpayer. Without common heritage, hopefully you will have sufficient incentives—as a result of all the Government spending that's gone into outer space so far—so that private enterprise will finally begin to capitalize on what has been a lot of help from the American people. With common heritage, forget it. It simply isn't possible.

Now, as a legal matter the moratorium effect becomes very clear to anybody who has also had lots of experience trying to get out from under a moratorium principle.

The statement by Mr. Hosenball which he cited did not really go far enough to preserve exploitation as a current freedom. Indeed, I think

that one of the most troublesome things about Mr. Hosenball's statement is that it shows an inconsistency of very important proportions.

If you look on page 10, Mr. Hosenball is quoting from a statement made presumably by himself or by some other American delegate at the Legal Subcommittee. At the bottom of page 10 he said:

> On the other hand, as I have at this session repeatedly, although I hope politely, made clear, the United States is not prepared to accept an express or implied prohibition on the exploitation of possible natural resources before the international conference meets and agrees on appropriate machinery and procedures and a treaty containing them takes effect. In our view, the Moon agreement cannot reasonably seek to require that exploitation must await the establishment of the treaty-based regime

I consider that to be an excellent and extraordinary statement in protection of our position. However, Mr. Chairman, on page 12 of Mr. Hosenball's statement, he quotes from his own statement before the Committee on the Peaceful Uses of Outer Space, around the middle of the page, as follows:

> The draft agreement—and I am particularly pleased about this, as a member of the National Aeronautics and Space Administration [NASA]—as part of the compromises made by many delegations, places no moratorium upon the exploitation of the natural resources on celestial bodies, pending the establishment of an international regime. This—"this" refers to the treaty—permits orderly attempts to establish that such exploitation is in fact feasible and practicable, by making possible experimental beginnings and, then, pilot operations, a process by which we believe we can learn if it will be practicable and feasible to exploit the mineral resources of such celestial bodies.

His own definition of the Moon Treaty excludes the permissibility of exploitation, and there is no question, using the civil law principle of a contrario sensu or the American legal principle of negative pregnant, that in this statement alone we have probably said to the rest of the world we do not think exploitation is permitted under the Moon Treaty. But, Mr. Chairman, I must point out the Moon Treaty does not expressly permit exploitation either. It talks about exploration and use. It does not talk about the exploitation of the resources. When it does talk about exploitation, it says there must be a treaty in connection with exploitation as soon as exploitation becomes feasible.

Mr. Chairman, there are a number of other arguments which I made in my testimony which I believe Congressman Breaux will also make which will lead inescapably to the conclusion that the United States would as a practical and a legal matter, by signing this treaty agree to a moratorium for an indefinite period of time—that is, until the next treaty is negotiated and pending its final outcome. In doing so, the United States will firmly and permanently discourage any of the new initiatives in the industrial uses of the resources of the Moon and other celestial bodies.

Finally, Mr. Chairman, let me say that, in the context of this treaty, there is absolutely no justification for conceding to Third World control the resources of our solar system.

In the Law of the Sea there was, in fact, a reason, although many disagree now with the decisions of the U.S. Government over three administrations that it was necessary to have that treaty at almost whatever the price in order to wrap up military freedoms. But in outer space we already have them wrapped up in the Outer Space Treaty, a treaty which is not under attack nor being repealed by the Third

World as an exercise in political domination in the U.N. system. It is a perfectly satisfactory treaty. We didn't need this new Moon Treaty for any important national interest. But if we sign this treaty and ratify it, we will be sacrificing an interest we cannot even calculate today in terms of the source of the world's resources in the next 100 years. Will they come from outer space, what will those resources be, and what happens to mankind's whole reach for outer space if we essentially put under an international socialist system the development of all the resources in the solar system beyond the Earth? That, Mr. Chairman, is a terrifying prospect. I am perplexed and puzzled as to how the Carter administration got this far, but never talked to the people in the administration who are responsible for negotiating common heritage for the deep seabed.

Mr. Chairman, I urge you to poll all Americans who have had anything to do with common heritage and ask them if they would have agreed to that principle and to its present usage in the treaty which they are negotiating, had it not been for the fact that they were trading military benefits. I know of no American who was connected with that conference who supports common heritage as a principle for a treaty on resources without getting some other benefit for the United States, like freedom of navigation for our military forces. Yet, that is precisely the situation that applies to the Moon Treaty.

Mr. Chairman, I do have a plea to make to this committee. First, be alarmed by what I've said today, but, second, please ask for other opinions from people who know what this is all about in the U.S. Government and from the outside. If my testimony today is supportable, I would urge communication with the administration just as quickly as possible, either in the form of a House Resolution or something else—letters, if necessary—to stop the Carter administration from letting that treaty be opened for signature in the General Assembly and, God forbid, signing it.

Thank you, Mr. Chairman.

Mr. FLIPPO. Thank you very much for your testimony, Mr. Ratiner.

Mr. Hosenball claims that the COPUOS agreed that the term, common heritage of mankind, although not specifically defined, is established by the terms of the Moon Treaty and not by implications of the treaty's usage.

Would you comment on this, and if this is the case would you have less concern over this term?

Mr. RATINER. Mr. Chairman, if that were the case I would still have a great deal of concern for any term which has had 13 years of multilateral negotiating history; but it would certainly be a more comfortable position, if comomn heritage were defined in the treaty. It is not in any way defined in the treaty. It has only been elaborated in one place on the face of the Earth and that's at the Law of the Sea Conference. It is now a legal doctrine. It is regarded by most of the world as international law already, even though it is not part of a treaty which the world has signed and ratified.

I might point out, Mr. Chairman, in this connection that it is inconceivable that one could—no matter how skilled an outer space negotiator Mr. Hosenball or any other person is—unnegotiate a doctrine like common heritage. The reason is that it's in another very similar context, that is, in an area where there are resources beyond the limits of national jurisdiction of any country.

But to make matters worse, if the Law of the Sea Treaty is signed and ratified by the United States, then there are 120 developing countries who have a vested interest in preserving the definition of common heritage. They will never agree to a treaty on outer space resources that waters down the definition they need to successfully manage, control, and exploit the resources of the deep seabed. It's inconceivable.

I suggest to you, Mr. Chairman, that I am not necessarily in disagreement with Mr. Hosenball, but I think he has a lot to learn about what's already happened in other forms. He's a busy man. He's been concerned with outer space. Somewhere the law of the sea bureaucracy failed to mesh with the outer space bureaucracy in the U.S. Government. I will tell you personally, Mr. Chairman, that when I was the American deep seabed negotiator in 1973 and heard that the Outer Space Legal Subcommittee was talking about common heritage as a principle, I asked for a meeting between our two delegations and urged them to consider the implications of common heritage being applied beyond the seabed, where we were hoping to keep it restricted. That was before I knew everything I know now about common heritage today. Today I have a full treaty I could show you for the record, spelling it out in detail.

They listened politely to me on the American delegation to the Outer Space Legal Subcommittee, but it was clear that they felt they would not suffer the same problems that the law of the sea negotiators suffered.

Mr. FLIPPO. Do you have any suggestions on how the Moon Treaty could be improved to insure that in any future use of mineral resources by anyone all interests will be protected?

Mr. RATINER. Mr. Chairman, that's another subject that I could spend quit a bit of time on, and I know you don't have the time.

There are many ways that a treaty can be structured so that there is genuine international participation in the development of international resources, without at the same time creating an international organization which has the monopoly powers, control and management over the development of those resources.

But what I would have to say to you today, Mr. Chairman, is that, because of the historical context which I painted earlier and the fact that we're in the midst of a developing country revolution in all the United Nations forums, I do not think any treaty could be negotiated right now in this next, let's say, 5- to 10-year period which could avoid the pitfalls of the Law of the Sea Conference.

We're dealing with a global phenomenon of mammoth proportions, and this isn't just rhetoric. These aren't just words that some clever negotiators thought up. This is a concerted pattern of activity by 120 countries over the past 10 years, and they have all coordinated with their other delegations dealing with other subjects. They know what these words mean.

Mr. FLIPPO. Mr. Ratiner, unfortunately we do have a vote on the floor. But I would like to furnish you some questions for a response in writing for the record, if you would agree to do that.

Mr. RATINER. I would be delighted to answer your questions.

Mr. FLIPPO. Your testimony has been very informative, and we appreciate your coming here and giving us the benefit of your thoughts, and thank you very much for giving us your time.

Mr. RATINER. Thank you very much.

Mr. FLIPPO. We're going to stand in recess until we have a chance to vote.

[Whereupon, the subcommittee was in recess from 12:43 until 12:55 p.m.]

Mr. FLIPPO. The subcommittee will come to order.

We now have Mrs. Eilene Galloway, vice president of International Institute of Space Law of the International Astronautical Federation.

We're delighted to have you.

Mrs. GALLOWAY. Thank you.

Mr. FLIPPO. Sorry you had to wait. We're looking forward to your testimony.

Mrs. GALLOWAY. That's all right. I learned a lot.

[The prepared statement of Mrs. Galloway follows:]

STATEMENT BY EILENE GALLOWAY, VICE PRESIDENT, INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION

CONTINUITY OF UNITED STATES POLICY ON INTERNATIONAL SPACE COOPERATION

Mr. Chairman and members of the committee, twenty-one years ago I had the opportunity of working as a staff researcher for Congressman John W. McCormack, Majority Leader of the House, who was Chairman of the Select Committee on Astronautics and Space Exploration which held hearings on how to organize the government to conduct a preeminent U.S. space program. Ever since that time I have been fortunate in being involved with our national and international space activities.

The result of legislative action by the House of Representatives and the Senate was the first space law—the National Aeronautics and Space Act of 1958—which established NASA, distinguished its civilian space program from that of the Department of Defense, and provided that all Federal agencies should cooperate in attaining effective use of our resources. That Act anticipated the interaction between national and international space activities, providing both in the Preamble and Section 205 that NASA conduct an international program devoted to "peaceful purposes for the benefit of all mankind." Subsequent authorization and appropriation laws reflected the fact that cooperation and appropriation laws reflected the fact that cooperation with other nations and groups of nations can only be accomplished on the basis of a strong national program.

The policy was further emphasized in 1958 when Congress passed Congressman McCormack's House Concurrent Resolution 332 "resolving that nations should join in the peaceful exploration of outer space for the good of all mankind rather than for the benefit of one nation or group of nations." The resolution held that international agreements could be achieved through the United Nations on legal, peaceful methods of developing benefits expected to flow from space exploration, particularly communications and weather forecasting.

The United States implemented this policy of international space cooperation in the United Nations by urging the creation in 1958, of the Ad hoc Committee, following by the permanent Committee on the Peaceful Uses of Outer Space where U.S. delegations have played a strong role for more than two decades in formulating five space treaties negotiated by the Legal Subcommittee. On numerous occasions Members and staff of the House and Senate space committees served on U.S. delegations to the United Nations Committee on the Peaceful Uses of Outer Space and its two subcommittees. The executive and legislative branches of our government have always spoken with one voice in seeking ways to ensure that outer space is used for peaceful purposes.

The consistency of legislative objectives on international space cooperation is also demonstrated in the Communications Satellite Act of 1962 where Congress declared that one of the purposes of COMSAT was to serve global communication needs not only of the United States but of other countries, including "services to economically less developed countries and areas."

In more recent legislation, this concept was emphasized in the National Science and Technology Policy, Organization and Priorities Act of 1976 as well as the Foreign Relations Authorization Act for Fiscal Year 1979 which provides methods

for strengthening the effective use of science and technology—including space activities—in the conduct of U.S. foreign policy for the benefit of the United States and other countries.

In another area related to international space activities, however, a hiatus developed in policy and implementation when the National Aeronautics and Space Council, established originally in the NASA Act of 1958 in the Title on Coordination, was abolished by a reorganization plan in 1973. This Council, at first created with the President in charge, and subsequently amended to make the Vice President Chairman, recognized that leadership and coordination of space activities must necessarily be exercised at the highest level of government. Although the Council was not a strong body, being located in the Executive Office of the President to give advice as the President might request, nevertheless its members represented the main departments and there was a highly qualified continuing professional staff to focus on total U.S. space activities. This overall function, which requires integrated plans and actions by a number of agencies, many of which have international programs, cannot be satisfactorily performed from within one agency which has no control over other departments and their budget allocations; nor can the function be exercised effectively by a committee which meets intermittently with changing personnel. Although the Council was abolished, the necessity for the centralized function continued, leading inevitably to a problem of "growing interaction among our various space activities", recognized five years later by the President in 1978.

RECENT SPACE DEVELOPMENTS

There has been a ferment in U.S. space policymaking since this Subcommittee held its hearings on international space activities in 1978, but this movement does not affect the basic doctrine of international cooperation for peaceful purposes for the benefit of all mankind; rather, the effort includes concern with extending and clarifying this fundamental concept. Review of space policy has been conducted in three centers: the Executive Branch, the Congress, and the United Nations. This is not to imply that space policies and programs are not being formulated by other countries and various international organizations, but the particular situation of the United States at this time can best be evaluated by throwing the spotlight on recent events within the government and in the United Nations.

The President requested the National Security Council Policy Review Committee to make an indepth study of space policy, and the results became a Presidential directive issued on June 20, 1978 as a White House Press Release. Since this review did not cover longer term objectives in defense, commerce and civil programs, it was followed on October 11, 1978 by a White House Fact Sheet on "U.S. Civil Space Policy." These directives include many points on international space activities and will be taken into account in the analysis of major international space problems covered by this testimony.

Meanwhile, in the Congress a number of space policy bills have been proposed. The Chairman of this Committee, Congressman Fuqua, introduced the Space Industrialization Act of 1979 (H.R. 2337) to encourage the use of outer space to develop new products, processes and industries. Representative Flippo and others proposed the Solar Power Satellite Research, Development and Evaluation Program Act of 1979 (H.R. 2335).

In the Senate the Space Policy Act of 1979 (S. 244) was introduced by Senator Adlai Stevenson to establish policies accompanied by program objectives. Senator Harrison Schmitt introduced the National Space and Aeronautics Policy Act of 1979 (S. 212) with proposals for policies and program goals. Senator Stevenson also introduced the Earth Data and Information Service Act of 1979 (S. 663) to provide a service in NASA for an operational remote sensing system, while Senator Schmitt proposed a bill on the same subject: the Earth Resources Information Act of 1979 (S. 875).

In the United Nations, the latest developments in international space policy and programs are described in reports of the Committee on the Peaceful Uses of Outer Space (A/AC.105/L.113, July 3, 1979) and those of the Legal Subcommittee (A/AC.105/249, April 10, 1979), and the Scientific and Technical Subcommittee (A/AC.105/238, February 26, 1979).

That this is a critical time for the evaluation of space policy, programs and appropriations is evident from the amount of attention being concentrated on uses of the space environment by the Executive and Legislative branches of the government as well as the United Nations. From official documents generated by

these three centers, and attendance at sessions. I have selected seven major international space problems which require analysis. In almost all cases there is interaction between national and international factors, and in every case it is necessary to think through separately the policy, implementing program and estimates of cost before combining these elements into interactive patterns. That is the best method of determining whether failure is caused by an ineffective or outworn policy, a program that is inadequate to meet policy objectives, or appropriations too limited to pay for the program. I would include management and administration under "program" because there are times when the policy is wise in terms of desired purposes, the program is well framed, the budget is adequate, but the entire enterprise flounders for lack of efficient management and administration. It is never helpful to assume that we have no policy or can coast along solely on policy when, in fact, the trouble lies in management, program planning or funding.

REMOTE SENSING OF THE EARTH BY SATELLITES

Remote sensing of the Earth by satellites has created a number of complex interrelated national and international problems. Within the United States the major question is how to organize and administer a national operational system which includes international cooperation. Within the United Nations there are active programs and negotiations on principles which could govern nations in the conduct of remote sensing with consequent repercussions on national space activities.

Remote sensing issues will come before the House Committee on Science and Technology in connection with authorizing appropriations for NASA for fiscal year 1981. NASA was directed by the President on October 11, 1978 to chair an interagency group to review remote sensing technology, program, and institutions for current and future systems, including the proposal to assign operational authority to a single lead agency. Decisions made by the Congress during its next session will determine the shape and pace of U.S. remote sensing activities for many years to come. These decisions on national organization and management of an operational system will also influence U.S. foreign policy and international patterns of cooperation in this global enterprise. Foresight in estimating methods likely to prove effective in attaining worldwide benefits from remote sensing technology is crucial to continuance of this space activity. Time is running out on the experimental Landsat program and further delay in decision-making can jeopardize U.S. leadership. Even though the policy is to provide data through the 1980's, the technological capability must be committed in terms of program and budget.

Some of the policies for remote sensing enunciated in the June and October 1978 statements are relevant to issues being discussed in the United Nations. Rejecting any limitations on the right to acquire data from space, the U.S. emphasizes that space systems are national property with the right of passage and operations in space without interference, a right which has been enjoyed by all nations since the beginning of the space age. Deliberate interference is viewed by the United States as "an infringement upon sovereign rights." U.S. policy is to operate remote sensing on a global basis with encouragement to domestic commercial exploitation by the private sector under government authorization, supervision or regulation. The practice of the widest dissemination of data will be continued, in the interest of the United States and other nations, to all users—public, private and international.

Although the policy is clear, the organization and management responsible for its implementation are not and the assumption is that the Landsat system "will evolve over the next several years to arrive at the appropriate technology mix, test organizational arrangements, and develop the potential to involve the private sector." This is a questionable assumption which arises from applying the scientific concept of evolution to what is essentially a problem in public administration. Functions which are divided between federal agencies do not in the course of time cohere naturally into an overall organization with management authority backed up by an adequate budget.

For some time a number of United Nations bodies have been actively proceeding with remote sensing activities and plans. The Food and Agriculture Organization (FAO) has a remote sensing center in Rome and is conducting programs on renewable resources such as fisheries, water management, agriculture/meteorology studies, in addition to on-the-job training courses for the education of experts from developing countries. Locust control, flood mapping and forest management all benefit from analyzed remote sensing imagery. The

Centre for Natural Resources, Energy and Transport (CNRET) has been established at the United Nations in New York to expand the application of remote sensing data to non-agricultural resources. The functions of CNRET are to store and interpret data, circulate information, give impartial advice on technical assistance projects, and organize training courses for those who use, manage, and make decisions on the basis of imagery from remote sensing.

The United Nations Environment Program (UNEP) is cooperating with FAO and UNESCO on projects involving Landsat data; for example, the assessment of tropical forests, soil degradation, range lands and deserts. The International Telecommunication Union (ITU) is involved in regulating, by the allocation of frequency bands, the radiocommunication segment of remote sensing systems. When reporting on remote sensing activities, the United Nations includes meteorological projects of the World Meteorological Organization (WMO) such as the World Weather Watch, the Global Atmospheric Research Program, the Tropical Cyclone Project, and the Integrated Global Ocean Stations System. This is different from the United States practice where a clear distinction is made between meteorology which has long been successfully organized operationally in the National Atmospheric and Oceanic Administration, and experimental Landsat imagery for which organization and management decisions for an operational program have yet to be made.

A number of national remote sensing systems have been or are being developed. The U.S.S.R. has operational METEOR satellites and also uses manned spacecraft and satellites equipped with automatic photography. France is developing the SPOT (Satellite Probatoire d'observation de la Terre), an experimental satellite to be launched by the Ariane from thee French Space Center in Guyana. Sweden is cooperating with France in developing the SPOT. Canada is considering an operational remote sensing system with cooperation from other nations. This year Japan is beginning the Marine Observation Satellite—1 (MOS–1). India has been planning a satellite for earth observation but is not yet successful. The European Space Agency is actively working on remote sensing projects, having developed METEOSAT, the geostationary meteorological satellite involving observations of Europe, Africa, and the Middle East. Land and ocean observations are being planned for later in the 1980s.

The emergence of all these systems and varied uses caused concern about avoiding conflicts, and establishing complementary and harmonius operations. This, in turn, has raised the question of the role of United Nations in coordinating remote sensing, and although the panel of experts proposed for this function has not been approved, the problem remains and will need solution in some manner in the future. It should be noted that all the national and international activities were set in motion and benefitted from the success of the Landsat system and there is considerable international demand for its continuance, a demand that is matched by State and Local governments in the United States.

The Legal Subcommittee has been instructed by the General Assembly for some years to conclude an international agreement on remote sensing of the Earth by satellites, and although some principles have been agreed upon, there remain serious issues on which there is no consensus.

The unresolved issues are:

1. What international responsibility do States have for their national activities in remote sensing whether they are carried out by the government or by non-governmental entities?

2. What access should a sensed State have to data pertaining to its territory—on mutually agreed terms with the sensing State? Or to the extent feasible and practicable? Or on a continuous and priority basis? Or no later than data is disposed of to any third State?

3. Must a sensing State be required to give advance notice to States whose territory is to be covered by a remote sensing satellite?

4. If a sensed State requests, must the sensing State consult without delay, particularly on questions concerning the dissemination of data and information?

5. What is the difference between, and how should we define, raw data and analyzed information derived from remote sensing?

6. Can international regulation be made on the basis of spatial resoluiton, i.e., with prior consent of the sensed State required for data of very fine degree but not for resolutions of a general nature?

7. Shall remote sensing be conducted in accordance with the sovereignty of all States over their wealth and natural resources, and without prejudice to Article

I of the 1967 Treaty on Outer Space which provides for freedom of exploration and use of outer space?

8. Shall disputes be resolved by prompt consultations, and if not mutually acceptable, through other established procedures?

At the present stage of deliberations in the Legal Subcommittee, it is not possible to attain a consensus on an international agreement, nor would any other method of making a decision, e.g., by some form of voting, be effective in attaining a result which would ensure compliance. This subject will continue on the agenda of the Legal Subcommittee when it meets for its 1980 session in Geneva.

The position of the United States on these issues is obvious from the Presidential statements of June/October 1978 which reaffirmed space policies followed by U.S. delegations to the Legal Subcommittee from the beginning of the exchange of views on this agenda item. The United States has been free to collect information from outer space and to disseminate it worldwide for a great variety of peaceful purposes of benefit to all nations.

DIRECT TELEVISION BROADCASTING SATELLITES

The problem is whether or not international agreement can be attained on principles to govern States in conducting international direct television broadcasting by satellities. This matter has been on the agenda of the Legal Subcommittee for some years, and although agreement has been achieved on some noncontroversial principles, there remain sharp issues which have proved irreconcilable.

The Committee on the Peaceful Uses of Outer Space and its two subcommittees conduct their work by consensus; that is, without voting, and it is therefore necessary for all 47 member States to agree to any decision. The consensus procedure was adopted because the development of national space programs could not be dependent upon majority votes in an international forum, especially when the national programs were legally based upon patterns of international cooperation designed to include all countries irrespective of their degree of economic or scientific development. The consensus method has proved practicable in the formulation of space law in five treaties, four of which are now in force. The time it takes to achieve a consensus is worth the result in laying a firm foundation of agreement and ensuring compliance with provisions among nations. Consensus is difficult to achieve, however, if the issues are too sharp; consensus depends upon a margin for give and take in negotiations. Unlike the space treaties which were negotiated by consensus and went into force in 1967, 1968, 1973 and 1975, the problem of direct broadcasting by satellites involves fundamental issues which reflect basic philosophical differences among governments, particularly between the United States which stands for the free flow of information and ideas, and the U.S.S.R. which insists upon controlling the content of programs.

The issues which continue to be discussed in the Legel Subcommittee are whether or not governments must control the content of broadcasted programs, regard some programs as unlawful and inadmissible, be required to seek the prior consent of States before programs are broadcast, and be responsible for activities carried out by them or under their jurisdiction. There are also differences in interpretation of the role of the International Telecommunication Union in controlling direct television broadcasting by satellites as some delegates think ITU technical regulations are sufficient to regulate such broadcasts while others disagree.

Fear of some nation flooding the world with unwanted broadcasts directly into home receivers has abated somewhat through the years, particularly since this development has not occurred. No difficulty developed on broadcasting into community receivers, a mission successfully carried out in a cooperative project between the United States and India. The unresolved issues concern individual reception of international programs.

The procedure for consensus negotiation takes the form of draft texts which set forth agreed principles while those in disagreement are placed in square brackets. Thus far, agreement has been achieved on recognizing benefits and "desiring to safeguard the legitimate rights and interests of all States", the applicability of international law, equal rights and benefits, international cooperation, copyright protection, and notification of direct broadcasting activities to the UN Secretary General. Square-bracketed issues include principles on Consultation and Agreements between States, and on this subject the United States made the following proposal:

"A State which proposes to establish or authorize the establishment of an international direct television broadcasting service by means of artificial earth satellites specifically aimed at a foreign State should, without delay, notify that State of such intention and should promptly enter into consultations with that State if the latter so requests. The State which proposes to establish or authorize such a service should take into account and give due regard to the interests and concerns of the foreign State in regard to the proposed service, as set forth in such consultations. Any such consultations should also be premised upon facilitating a free flow and a wider dissemination of information of all kinds and encouraging co-operation in the field of information and the exchange of information with other countries." (A/AC.105/C.2/L118, March 22, 1979).

Future discussions of international direct television broadcasting by satellite might take into account the idea that the Legal Subcommittee can serve a useful purpose by discussing all elements of a problem without being requested in each case to formulate guiding principles intended for treaty ratification. The exchange of views among delegates is educational and can be expected to influence planning at national levels. The Scientific and Technical Subcommittee can engage in rewarding discussions without necessarily concluding agreements and the Legal Subcommittee need not be under constant pressure by having most agenda items assigned "high priority", nor need there be any criticism because space treaties are not formulated quickly. The Legal Subcommittee has achieved an enviable record in space law during the past dozen years and this year the full Committee went on to conclude an Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, to be voted on by the General Assembly this fall.

INTERNATIONAL REGULATION OF NUCLEAR POWER FOR SATELLITES

Nuclear power for satellites dramatically became an international problem when the U.S.S.R. Cosmos 954 malfunctioned and entered Canadian airspace on January 24, 1978, scattering radioactive debris over an area the size of Austria. This ocean surveillance satellite in earth orbit was powered by a nuclear reactor using uranium enriched with isotope of uranium-235. It was not a weapon and there was no danger of an explosion; nevertheless, there was worldwide alarm which came to a focus when the Scientific and Technical Subcommittee began its session at the United Nations on February 13, 1978, two weeks after the radioactive impact on Canadian soil. In accordance with space treaty provisions, Canada notified the Secretary General of the United Nations. This "newly perceived problem" was not on the Subcommittee's agenda but was promptly discussed under "other matters." All nations could be affected by the future use of nuclear power for satellites and delegates from many countries called for international cooperation to prevent harmful contamination and damage by the control and regulation of this potential danger to life and the environment.

Understanding of the scientific and technological aspects of the problem is essential because there are missions which cannot be performed with solar energy and must depend upon nuclear power. The problem is not to prohibit the use of MPS altogether but to formulate acceptable controls. The United States, which assisted Canada promptly with experts and specialized equipment in radiation detection for the search and recovery operation, has strict national controls and submitted a factual report to the United Nations on this matter. Nuclear power sources for satellites are used by the United States for deep space, interplanetary missions and lunar landings. In remote, hostile or special environments, solar cells for power will not survive. Thus, missions involving Mars, Jupiter and Saturn all require energy from nuclear power, and such will be used for the Jupiter Orbiter/Probe (Galideo) approved by Congress in 1977 for launching in 1982. NASA has not used nuclear power for earth orbits, however, except for the Nimbus III satellite in 1969.

The Soviet delegate reported that the U.S.S.R. uses safety standards for NTS, and when used in earth orbits, the plan is to lift such satellites to a higher altitude where they will decay over a period of some hundreds of years.

During 1978 and 1979, the problem has undergone the most intensive discussion in the Scientific and Technical Subcommittee, the Legal Subcommittee, and the full Committee on the Peaceful Uses of Outer Space. Member States have been asked to submit reports and the Secretariat is working on in-depth factual studies which are scheduled for completion prior to the 1980 sessions of the UN

bodies. The 1979 Working Group established by the Scientific and Technical Subcommittee agreed that if safety precautions are met, NPS can be used safely. They concluded that studies are needed on—

1. Elaboration of an inventory of the safety problems involved in the use of NPS in outer space.
2. The implementation of International Commission on Radiological Protection (ICRP) recommendations for populations and the environment in the context of space vehicles utilizing NPS.
3. Evaluate existing methods in understanding orbital mechanics to determine if improvements may be made in predicting re-entry phenomena.
4. Define technical considerations with regard to a format for notification.

The Legal Subcommittee will get started with its analysis of NPS after it has received some, but probably not all, the scientific and technological data necessary for space law purposes. The Legal Subcommittee's agenda for 1980 includes "Review of existing international law relevant to outer space activities with a view of determining the appropriateness of supplementing such law with provisions relating to the uses of nuclear power sources in outer space." The Subcommittee should determine whether existing space treaties can be amended or a new international agreement is required. The delegates should also determine whether there are other hazards which can be identified and combined with NPS in one treaty, hazards such as contamination from other sources and the disposal of nuclear waste in outer space. Another question is the possibility of an existing international institution being given responsibility for certain regulatory functions, e.g., the International Atomic Energy Agency. It will be necessary to define the similarities and differences between radioactive debris and debris that is not radioactive in terms of danger to life and the environment, search, recovery and cleanup operations, and liability for damage caused by space objects.

One of the positive factors to be noted is that when this NPS problem suddenly arose, there were international institutional arrangements and working procedures for its consideration, and the method of first attacking the problem was an appeal to experts and the collection of scientific and technical facts.

We can estimate that this particular problem is on track for an effective solution. All scientists and engineers are motivated by the desire to have their projects work as perfectly as possible to accomplish their missions without harmful consequences. In this case, the motivation is powerful. A satisfactory solution could be impeded if the Legal Subcommittee made decisions before all the scientific and technical facts have been made available by the Scientific and Technical Subcommittee; awareness of this possibility should be sufficient to avoid partial legal measures so that consensus can be negotiated from a base of complete factual data.

MATTERS RELATING TO THE DEFINITION AND/OR DELIMITATION OF OUTER SPACE AND OUTER SPACE ACTIVITIES, BEARING IN MIND, INTER ALIA, QUESTIONS RELATING TO THE GEOSTATIONARY ORBIT

This Legal Subcommittee agenda item has grown to combine complicated separate but interrelated problems so that it is practically insoluble in its present form. We have often heard that it is easier to solve a problem if it is accurately defined, and until each element of this agenda item is clarified, it is unlikely that its various parts can be reconciled by consensus.

The problem began in the United Nations with an attempt to distinguish between airspace where sovereignty prevails and outer space where sovereign claims are prohibited by the 1967 Treaty on Outer Space. In fact, philosophical treatises on drawing a line between airspace and outer space antedated even the orbiting of satellites. The word "delimitation" originally implied a boundary between airspace and outer space but was discussed by the Legal Subcommittee in terms of where outer space begins, a natural result of its jurisdiction over outer space but not airspace which is primarily the concern of the UN specialized agency, the International Civil Aviation Organization (ICAO). As the discussion proceeded, however, the problem was not only the definition and/or delimitation of outer space but also the delimitation of outer space activities which implies that certain activities could be limited; and furthermore that they could be limited by means of defining the area of outer space. This was more than limiting outer space to peaceful purposes and banning weapons of mass destruction as the concept can be extended to limiting peaceful functions such as space communications, remote sensing, industrialization, etc. The international discussions then proceeded to add: "among other questions" (which are not specified) those "relating to the geostationary orbit."

Problems which have arisen concerning the uses of the geostationary orbit, which is inextricably intertwined with the allocation of the radio spectrum, go far beyond defining where outer space begins and have for some time been handled by the International Telecommunication Union.

The salient features of the present situation concerning this multi-faceted agenda item are that (1) The exploration and use of outer space has continued since 1957 without a definition and there have been not problems whose solution depended upon a definition. (2) U.S. policy is that a definition is not necessary. (3) Claims by the equatorial countries to segments of the geostationary orbit above their national territories are rejected by almost all members of the Committee on the Peaceful Uses of Outer Space whose position is that the 1967 Treaty on Outer Space already provides taht this orbit is in outer space. (4) The question of where airspace ends and outer space begins is perceived as a problem by members of the Outer Space Committee and will continue to be discussed, but the International Civil Aviation Organization and other experts in aviation law are not pushing for a definition; ICAO cannot undertake a study of the question unless requested and a request has not yet been made; aviation lawyers assume that airspace is as high as a plane can fly and apparently are not experiencing problems with this interpretation. (5) Renewed efforts for a definition have arisen because of possible legal problems in connection with the U.S. space shuttle, but according to U.S. law the shuttle is a spacecraft and not an aircraft. (6) The U.S.S.R. has proposed that the region above 100 (110) km altitude from sea level is outer space and that the boundary between airspace and outer space be established later by a treaty at an altitude not to exceed 100 (110) km above sea level. They also propose that space objects retain the right to fly over other States at lower altitudes in order to reach outer space or return to earth. (7) The Scientific and Technical Subcommittee has been unable to give the Legal Subcommittee a scientific basis to use for a definition. (8) There has been little concern with limiting outer space activities in general under this agenda item; it comes up for discussion mostly in demands by the equatorial countries that their permission be requested by other States which use segments of the geostationary orbit above their territories; however, the item is worded so that it could apply to discussions on limiting outer space activities no matter what application is involved.

The World Administrative Radio Conference for Space Telecommunications of the ITU (WARG-ST) in 1971 resolved that all countries have "equal rights in the use of both the radio frequencies allocated to various space radiocommunication services and the geostationary satellite orbit for these services", and furthermore that "the radio frequencies spectrum and the geostationary satellite orbit are "limited natural resources" to be used "most effectively and economically." These resolutions became in 1973 part of the International Telecommunication Convention (October 25, 1973, Art. 32 (2), (35)) which binds Members to operate stations without harmful interference with others, and to keep in mind that "radio frequencies and the geostationary satellite are limited natural resources so that countries or groups of countries may have equitable access to both in conformity with the provisions of Radio Regulations according to their needs and the technical facilities at their disposal."

Undoubtedly the WARC conference, which is to be held during September to November 1979, will add to the discussion on uses of the geostationary orbit and these will be taken into account by the Legal Subcommittee when it meets in Geneva in 1980.

There is a problem stemming from this debate which also comes up in connection with other subjects. This is the assumption by the equatorial countries,[1] and by some other nations, that freedom to explore and use outer space on a basis of equality and without discrimination, as provided in Article I of the 1967 Treaty on Outer Space, is not possible unless they have launching facilities.

They do not recognize the fact that benefits from using the space environment, such as worldwide communications, weather prediction, monitoring of air, land and sea pollution, etc., have been enjoyed by all countries as a consequence of space technology being naturally global in its impact, and also as a consequence of U.S. policy to launch satellites, and experiments in satellites, for other nations. They assume that "equal access" means equal capability to launch. This interpretation has gone so far that some international lawyers, unfamiliar with the history and variety of space developments, have written that less developed

[1] In November 1976 the Bogota Declaration was made by equatorial countries Colombia, Congo, Ecuador, Indonesia, Kenya, Uganda, Zaire; Brazil was an observer.

countries have never benefitted from space applications because they lack the capabilities enjoyed by the two space powers. When this misconception is combined with conclusions drawn from such general concepts as "the province of all mankind", "the common heritage of all mankind", space activities "for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development", the result is the creation of philosophical and legal obstacles which are difficult to overcome. Perhaps a study on the economic and technical implications of every nation in the world constructing launching facilities would be helpful in dealing with this situation. Such psychological problems are not immaterial; they can become obstructions to practical space industrialization projects such as solar energy. There has been a remarkable degree of sharing of launching facilities. The purpose of space law should not be to restrict the progress of space applications requiring the use of the geostationary orbit.

SPACE TRANSPORTATION SYSTEMS

The emergence of several space transportation systems creates problems concerning their relationship and a pattern of international accommodation. Perceiving that questions of coordination and cooperation are bound to arise, the UN General Assembly requested the Scientific and Technical Subcommittee to consider the matter. At its February 1979 session in New York the Subcommittee received three program reports. The U.S.S.R. described the development of scientific space stations based on manned Soyuz and automatic Progress modules and intended for orbits lasting a long time. The United States reported on the space shuttle with its Spacelab contribution from Europe and the remote manipulator system from Canada. Planned for operations beginning in February 1981, 41 payloads had been booked through early 1983 and 274 small self-contained payloads were available, pricing being fixed on a shared basis.

The European Space Agency brought the Subcommittee up to date about the Ariane program whose purpose is to achieve "in late 1980 an economically competitive European capability of placing satellites in orbit, particularly geostationary satellites of the order of 900 kg." Four launches are planned for 1980.

From this developing situation, the Subcommittee considered that a study was needed on the "scientific, technical, economic and social implacations" of space transportation systems and the Secretariat was assigned this task. Member States and international organizations have been asked for their views on this matter so that it can be considered in more depth during the 1980 Subcommittee session.

The main problem for the United States will be management and operation of the shuttle program with attention to interactions between national and international factors and a policy concerning the role of the United Nations in this and other areas where coordination or some form of regulation is sought. These decisions can affect plans for space industrialization.

SOLAR ENERGY SATELLITES

Satellite power stations for conversion of solar energy for transmission to the Earth are being studied by the Department of Energy and NASA. This type of project will be affected by the President's statement of October 11, 1978 on U.S. Civil Space Policy that "It is neither feasible nor necessary at this time to commit the United States to a high-challenge space engineering initiative comparable to Apollo". Federal budget commitments are to be made to other objectives covered by the statement. It is not too soon, however, to analyze the type of international organization that is likely to be most effective in dealing with solar energy space projects. Satellite power stations using the geo-stationary orbit require complete foresighted integration of national and international programs. The subject has already come up for discussion in the United Nations. If projects such as these are always undertaken nationally solely on a research and development basis, the elements necessary for merging into an operational system may not be woven into initial planning. We should try to avoid the difficulties involved with going from an experimental to an operational system, which we have suffered from the Landsat program, and adopt the assumptions which preceded the organization of the space meteorological program whose objective from the beginning was to become operational.

There are other practical considerations to keep in mind. Any large solar energy structure, or other comparable industry in space, is particularly vulnerable to intentional interference and therefore calls for the prior settlement

of any arms control and disarmament problems so that outer space is absolutely safe for the conduct of peaceful purposes.

THE MOON AND OTHER CELESTIAL BODIES

When the UN Committee on the Peaceful Uses of Outer Space ended its session in July 1979, the text of the "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies" had been completed and sent to the General Assembly where it is expected to be approved this fall. This Agreement calls for future establishment of an international regime with "appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible." The use and exploration of the Moon is considered "the province of all mankind" and is to be "carried out for the benefit and in the interests of all countries." The Moon and its natural resources are also "the common heritage of mankind". Future plans for space industrialization will need to take this treaty into account, determining when scientific research and development reaches a terminal date and the possibility of exploitation of natural resources can begin. Beyond that, advance planning is needed to determine the kind of international regime to govern exploitation in accordance with the main purposes set forth in the treaty: orderly and safe development, rational management of resources, expansion of opportunities for using resources, and equitable sharing of the benefits derived from resources by all States that are parties to the treaty. The private sector will need to know the conditions which must be met in order to carry on space industries requiring the use of the Moon and other celestial bodies.

CONCLUSIONS AND GENERAL OBSERVATIONS

Ensuring success for the total U.S. space program calls for the integration in coordinated form of a number of factors: (1) the constant interaction between national and international space activities; (2) uses of the space program in the conduct of U.S. foreign relations; (3) United Nations consideration of space problems of consequence to the United States; (4) the variety of space applications used by an increasing number of governmental agencies at the federal, state and local levels; (5) the necessity of providing the private sector with reliable conditions to ensure their successful participation in future applications of space technology; and (6) the requirement for smooth correlation of policy with implementing programs and due regard for their cost.

When the overall coordinating mechanism provided by the National Aeronautics and Space Council with its continuing professional staff was abolished by a reorganization plan in 1973, it was not replaced by any adequate administration device to oversee total U.S. space activities. The decentralizing result spread for more than five years before the Office of Science and Technology was established but with outer space as only one of thirteen goals and with only partial authority for the centralized function.

This situation probably accounts for the delay in decisionmaking on an operational system for remote sensing of the Earth by satellites, even though Congress has been steadily urging an operational institution for several years. An additional factor, however, must be taken into account. There is considerable fuzziness about whether or not NASA is legally only a research and development agency or can undertake operational responsibility in astronautics. It was never intended that NASA should operate aeronautics and the relationship between government and the aviation industry was clear and had been well established some time before the space age began in 1957. In 1958 when the NASA Act was formulated, it was not known what the development of space applications might entail. It was fairly easy to turn communications over to COMSAT which eventually led to INTELSAT, and to turn meteorological matters over to the Department of Commerce. So the issue of NASA and R&D did not actively surface until proposals were made for Landsat to become operational.

The ambiguities in legal interpretation should be cleared up by amending the NASA Act or by incorporating a provision in the authorization act that NASA can operate space applications as designated by the President or the Congress. It is not a question of general operating authority but of providing flexibility. There is no existing institution to which multi-purpose remote sensing applications can be turned over, and as time goes on there will be more issues of this kind. If NASA is solely R&D in astronautics, it will eventually shrink and undertake projects only if they can be foreseen as eligible for operations by some other agency; or

astronautics R&D will be undertaken and stop at the water's edge of development and it will be difficult to phase projects into operations. The pattern followed by the small National Advisory Committee on Aeronautics in relation to aviation is not applicable to NASA in relation to astronautics and can even delay or prevent NASA from being named as a lead agency for space activities. This legal/psychological situation is ironic when we consider the outstanding performance of NASA in operating the Apollo program. Few human ventures requiring coordination of such a variety of parts can match the success of the Apollo operation.

Even if a definite proposal for an operational remote sensing system comes before the Congressional Committees for the fiscal year 1981 budget, it will not solve the problem of centralized guidance for the total U.S. space program with a continuing institutional memory in the Executive Branch. If only options are proposed for remote sensing, it will mean further delay at a time when international action by other nations and organizations is developing apace. Other space activities which are now conducted by a number of departments cannot be expected to evolve into a coherent system. They will remain dispersed with the potential for unnecessary disharmony. The overall task cannot be done by a committee which meets intermittently with varying personnel and no permanent professional staff, and, even less accomplished by a series of ad hoc committees. We should bring to this problem the experience of that specialized profession—Public Administration; and even then we must call upon experts in government organization and management who have taken the time to learn the facts about space science and technology. The problem is how to bring about an effective functional system which combines centralization and decentralization.

I have included a number of other recommendations in the separate sections of this testimony on remote sensing, international direct television broadcasting satellites, nuclear power for satellites, the definition of outer space, space stations, and future studies needed in connection with the new treaty on the Moon and Other Celestial Bodies.

Additionally, I wish to point out the danger of dealing with any of these problems in purely general terms which can mean different things to different people and nations. For example, "technology transfer" has been used to describe transfer from the United States to developing and developed countries, transfer from the Federal Government to State governments, transfer from NASA to other departments and agencies, transfer from the Department of Defense to NASA, transfers between military and civilian programs, and transfer from the Federal government to the private sector. Some people assume technology transfer is always beneficial while others analyze disadvantages in specific cases.

The term "developing countries" is often used without a list of the countries or some idea of when they will be developed, and the specifics are apt to be different for various commodities and countries.

"International regimes" are generally advocated and range all the way from minimum international cooperation to an international operating agency with regulatory control over specific functions. If two nations agree on an international regime and one assumes minimum arrangements and the other is convinced of maximum operations, the result can be the creation of new problems.

"The province of all mankind" and "the common heritage of all mankind" will elicit different definitions. "Common heritage" can mean community ownership or no ownership.

Definitions are needed to preclude misunderstandings in international relations.

Fortunately, the analysis of all these problems can be undertaken by this Committee in connection with its legislative and review jurisdiction of United States space activities.

STATEMENT OF EILENE GALLOWAY, VICE PRESIDENT, INTERNATIONAL INSTITUTE OF SPACE LAW OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION

Mrs. GALLOWAY. Mr. Chairman, this is an anniversary for me to be here because I worked for Congressman McCormack and Lyndon Johnson all during 1958 on the original NASA Act, and at that time it was very clear that we were combining national and international space activities. Since that time there has been a continuity in U.S. space policy on international space cooperation.

Mr. McCormack had introduced a concurrent resolution in 1958 on international space cooperation and also pointed out that we could use the United Nations to come to agreement. Since that time we have the Comsat Act and the National Science and Technology Policy, Organization and Priorities Act, and there has always been harmony between the executive and legislative branches on international space cooperation. But that act also provided for coordination, and there is a title in the NASA Act on coordination which gave outer space a priority in the executive branch at the highest level. First the President and then the Vice President became Chairman of the National Aeronautics and Space Council, and when this council was abolished in 1973 by a reorganization plan we lost that priority, and it was over 5 years before the Office of Science and Technology was established, and they have only partial authority concerning overall coordination.

So it seems to me very rewarding that this committee has jurisdiction over the total U.S. space program and can combine the national and international, which have factors that are always interacting.

I was asked to choose the most important international problems, and every one of these problems—I've chosen seven of them—every one of them has both national and international factors, and I think each one of them is pertinent to this committee's authorization for the 1981 fiscal year budget for NASA.

The first problem is remote sensing of the Earth by satellite.

If my whole statement can be put into the record, I will just summarize this.

The main issue there is whether or not we are going to establish nationally an operational remote sensing system. It isn't enough to have a policy saying we're going to give data to people and information through the 1980's if you don't have a program that goes along with it and decide whether Landsat D and Landsat D′ can do that.

In the meantime, there's a great deal of activity in the United Nations on remote sensing, and a number of countries and organizations are working on their own projects. Time is running out on that, and if we don't make a decision nationally on what we're going to do and get that policy and the hardware and the funding we are going to find that international decisions have been made that affect our national program.

The second problem is international direct television broadcasting satellites, which started out with a great deal of excited debate. I think those early fears have abated somewhat because now nations think that the United States is not going to cover the world with unwanted programs. But that is an example of an issue which is so sharp that it is rather difficult to get a consensus in the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space. To get a consensus you need to have a little margin on either side so that you have some give and take, and in the case of direct broadcast satellites we have the issue of the United States wanting the free flow of information and ideas and the Soviet Union wanting control of the program content, and there are nations on either side that adhere to one or the other of those two points of view.

On this point, I think it would be a good idea if the United States would work through the General Assembly to see that when the Committee on Peaceful Uses gets instructions not every single subject

should be made into a treaty. I mean, we just can't go on formulating these treaties indefinitely.

The Legal Subcommittee and the full committee should not be graded on the number of treaties. They have a wonderful record. They have negotiated five treaties, and four of them are now in force. But if there is a problem involving irreconcilable elements, it might be worth having on the agenda for discussion purposes only, so that people could learn and take back to their nations some of the different points of view.

Another problem is nuclear power for satellites.

I think this is an example of great success in how to go about solving an international program internationally where there is a lot of national concern. This problem arose when the Soviet 954 entered Canada's airspace and scattered radioactive debris over a wide area about the size of Austria.

The United States, Canada, and the Soviet Union are all members of all the four space treaties. The United States assisted with the search, recovery, and cleanup operations.

The Canadians have made a claim against the Soviet Union for over $6 million, and there was, of course, a great deal of excitement about this. It wasn't just Canada and the Soviet Union. Every nation that was represented on that United Nations Committee had delegates who got very excited because they were worried about radioactive debris, with the result that the subject was taken up 2 weeks after the Soviet satellite fell by the U.N. Scientific and Technical Subcommittee. Last year and this year they have worked, and finally they have placed the subject on the agenda of the Legal Subcommittee. This is an achievement because it is extremely difficult to get a subject on the agenda to begin with. It's almost impossible to get one off if you don't want it any more.

But in this particular case they had a subject called "Other Matters," and "Other Matters" could include nuclear power for satellites.

The Soviet satellite was not a weapon. It wasn't going to explode, but people were worried about the health hazard and possible hazards to the environment from radioactive contamination.

The result of this fear was that they attacked this program by appealing to experts in science who know a great deal about the subject, and they are continuing to deal with it in that way and it is on the agenda of both subcommittees in 1980.

Really, I think that the solution to that problem is on track. We must have nuclear power for satellites. It's not a question of banning its use because there are missions that cannot be accomplished, interplanetary missions and in hostile environments, unless we do use nuclear power, and the United States and the Soviet Union both have methods of trying to make it as safe as possible.

The fourth problem concerns the definition and/or delimitation of outer space.

This is a most curious item. It is worded on the agenda so that I think it can never be solved. It is called "Matters Relating to the Definition and/or Delimitation of Outer Space and Outer Space Activities, Bearing in Mind, Inter Alia, Questions Relating to the Geostationary Orbit."

The problem began in the United Nations with an attempt to distinguish between airspace and outer space, and that was all it was: Where do you draw the boundary? They decided not to be worried about that problem and went ahead and successfully formulated the 1967 Treaty on Outer Space. But some people were still worried about where airspace ends, where we had sovereignty, and where outer space begins, where sovereign claims are prohibited by treaty and they were talking about delimitation because this committee could only talk about outer space. The U.N. Committee on the Peaceful Uses of Outer Space couldn't talk about the airspace, over which it has no jurisdiction. Airspace is mostly under the U.N. International Civil Aviation Organization.

Then somebody added "outer space activities." That was a whole new ball game because here we were not only delimiting outer space but we were delimiting outer space activities. Before that the activities we wanted to profit were weapons and weapons of mass destruction. But now "outer space activities could apply to almost anything. It could apply to remote sensing, direct broadcast, or whatever.

Then along came the equatorial countries, and they wanted parts of the geostationary orbit, and they added that idea. There were some people who thought that would be solved solely by a definition, whereas most delegates concluded that the 1967 treaty definitely put the geostationary orbit into outer space.

There is a problem stemming from this debate on the geostationary orbit that also comes up in connection with other subjects, and this is the assumption by the equatorial countries and some other nations that freedom to explore outer space on a basis of equality and without any discrimination, as provided in article I of the 1967 Treaty on Outer Space, is not possible unless they have launching facilities. They do not come out and say this, but assume that they can't benefit. Some lawyers who are unfamiliar with space science and technology say that none of the developing countries has benefited, presumably because they don't have launching facilities. This does not take into account the fact that the United States has a policy to launch for other nations as long as the spacecraft are peaceful. The Soviet Union has also launched for other nations, and the French will have the Ariane that will launch for others.

Something needs to be done to dispel this assumption, which is very pernicious because it makes people come to erroneous conclusions. The delegate from one country said—it's a very little country—"The only place where we can have a launching facility would be here by this little mountain." The amount of money it would cost each nation and all kinds of scheduling problems should be clarified in order to dispel this misconception.

Space transportation systems are being developed by a number of other countries and also by international organizations, and the United Nations has taken that up because they want these systems to be compatible, and there is always great concern about the role of the United Nations, just exactly what role it is to play in coordination.

The same thing is true of solar energy satellites, and although discussion is only beginning, it is not too soon for us to make studies of

evaluation because it's connected with the use of the geostationary orbit.

The Moon and other celestial bodies, I think you have covered enough in previous testimony, so I will leap on to my conclusions.

Insuring success for the total U.S. space program—and I emphasize total because we have so many departments and agencies using or engaged in it—calls for the integration in a coordinated form of a number of factors: First, there is the constant interaction between national and international space activities. If you make a decision on one it affects the others. Second, we have the uses of the space program in the conduct of U.S. foreign relations. Congress just passed a law and appropriated money again during this session to set up a special unit in the Department of State for that purpose, and that includes outer space as well as other science and technology. Third, United Nations consideration of space problems that are of consequence to the United States, decisions that are made there that affect our national activities. Fourth, we have the variety of space applications used by an increasing number of governmental agencies at the Federal, State, and local levels. Fifth, there is the necessity of providing the private sector with reliable conditions to insure their successful participation in future applications of space technology. Sixth, we have the requirement for the smooth correlation of policy with programs that really implement the policy and with due regard for their cost.

When the overall coordinating mechanism provided by the National Aeronautics and Space Council with its continuing professional staff was abolished in 1973, it was not replaced by any adequate administrative device to oversee total U.S. space activities. The decentralizing result spread, as I mentioned, for more than 5 years before the Office of Science and Technology was established, and outer space is only 1 of 13 goals and the OST has only partial authority for the centralized function.

This situation probably accounts for the delay in decisionmaking on an operational system for remote sensing of the Earth by satellites, even though Congress has been steadily urging an operational institution for several years. An additional factor, however, must be taken into account. There is considerable fuzziness about whether or not NASA is legally only a research and development agency or can undertake operational responsibilities in astronautics. It was never intended that NASA should operate aeronautics, and the relationship between government and the aviation industry was very clear and had been well established some time before the space age began in 1957. But in 1958 when NASA was created it was not known what the development of space applications might entail. It was easy to turn communications over to COMSAT, leading to INTELSAT, and to turn meteorology over to the Department of Commerce that had always had the weather bureau. So the issue of NASA and R. & D. did not actively surface until proposals were made for LANDSAT to become operational.

The ambiguities in legal interpretation should be cleared up by amending the NASA Act or by incorporating a provision in the Authorization Act that NASA can operate space applications as designated by the President or the Congress. It is not a question of general operating authority, but of providing flexibility. There is no existing

institution to which multipurpose remote sensing applications can be turned over, and as time goes on there will be more issues of this kind. If NASA is solely R. & D. in astronautics, it will eventually shrink and undertake projects only if they can be foreseen as eligible for operations by some other agency; or astronautics R. & D. will be undertaken and stop at the water's edge of development and it will be difficult to phase projects into operations. The pattern followed by the small National Advisory Committee on Aeronautics, the NACA, in relation to aviation is not applicable to NASA in relation to astronautics and can even delay or prevent NASA from being named as a lead agency for space applications. This legal/psychological situation is ironic when we consider the outstanding performance of NASA in operating the Apollo program. Few human ventures requiring coordination of such a variety of parts can match the success of that Apollo operation.

Even if a definite proposal for an operational remote sensing system comes before the congressional committees for the fiscal year 1981 budget, it will not solve the problem of centralized guidance for the total U.S. space program with a continuing institutional memory in the executive branch. If only options are proposed for remote sensing, it will mean further delay at a time when international action by other nations and organizations is developing apace. Other space activities which are now conducted by a number of departments cannot be expected to evolve into a coherent system. They will remain dispersed with the potential for unnecessary disharmony. The overall task cannot be done by a committee which meets intermittenty in the executive branch with varying personnel and no permanent professional staff, and even less accomplished by a series of ad hoc committees. We should bring to this problem the experience of that specialized profession—public administration—and even then we must call upon experts in Government organization and management who have taken time to learn the facts about space science and technology. The problem is how to bring about an effective functional system which combines centralization and decentralization.

Additionally, I want to point out the danger of dealing with any of these problems in purely general terms, which can mean different things to different people and nations. For example, "technology transfer" has been used to describe transfer from the United States to developing and developed countries, transfer from the Federal Government to State governments, transfer from NASA to other departments and agencies, transfer from the Department of Defense to NASA, transfers between military and civilian programs, and transfer from the Federal Government to the private sector. Some people assume technology transfer is always beneficial, while others analyze disadvantages in specific cases.

The general term "developing countries" is often used without a list of the countries or some idea of when they will be developed, and the specifics are apt to be different for various commodities and countries.

Then we have the term "international regimes." They are generally advocated for almost any purpose and range all the way from minimum international cooperation to an international operating agency with regulatory control over specific functions. If two nations agree on an international regime and one assumes minimum arrange-

ments and the other is convinced of maximum operations, the result can be the creation of new problems.

Then we have "the province of all mankind" and "the common heritage of all mankind," which will elicit different definitions. "Common heritage" can mean community ownership or no ownership and today we have mentioned the North–South, which is a shorthand expression, and it is not accurate because Australia and New Zealand are in the Southern Hemisphere and they are not developing nations. Presumably they're developed. Whereas, India is in the Northern Hemisphere and is usually referred to as a developing nation.

So I think we need definitions to preclude misunderstandings in international relations.

Fortunately, the analysis of all these problems can be undertaken, I think, by this committee in connection with the 1981 budget.

Mr. FLIPPO. Thank you very much.

Could you tell me if you think there is a need for better coordination of activities between the various U.N. agencies in space applications, and if you do, how can we get better coordination between those agencies?

Mrs. GALLOWAY. The United Nations has a system of coordination, and they get out regular reports, coordinating within the United Nations between the Economic and Social Council and the other bodies that are operating there.

Of course, the people who come to specific meetings may not read all these other reports, but they are always aware of that coordination, and sometimes they have difficulty. They knew they had to have a Scientific and Technical Subcommittee and a Legal Subcommittee, but sometimes they have trouble getting them together, and when you go to the Legal Subcommittee—I was there the whole month of this year—you can tell which delegates have read the reports of the Scientific and Technical Subcommittee because they bring it into the discussion.

Mr. FLIPPO. Do you think a technically oriented U.N. Conference on Outer Space is feasible at this time?

Mrs. GALLOWAY. I think that it's feasible, however international projects are naturally affected by political and economic conditions and we must be prepared to deal with the interactions of all relevant factors.

Mr. FLIPPO. Thank you very much for your testimony. We appreciate it very much. And thank you for staying with us during those many delays.

Mrs. GALLOWAY. I enjoyed it very much.

[Questions and answers for the record follow:]

ANSWERS TO QUESTIONS FOR HEARINGS ON INTERNATIONAL SPACE ACTIVITIES

(Request to Mrs. Eilene Galloway from Congressman Don Fuqua, Chairman)

Question 1. What user education activities do you think the United Nations could engage in which would promote the use of remote sensing data by the developing nations? Should a user infrastructure be developed at the United Nations in order to motivate and aggregate the user community?

Answer. Ever since it became evident that experimental LANDSAT data and information could be used operationally—that is, to assist positively in the solution of a variety of problems—many nations throughout the world have been obtaining the information from the system established by the National Aeronautics and Space Administration and the Department of the Interior. Concurrently, the

United Nations began positive activities to promote the use of remotely sensed information by developing, and also developed, countries. The United Nations Expert on Space Applications has been deeply involved with seminars and training programs. Mr. H. G. S. Murthy, the second official to hold this position, recently retired and has been replaced by Mr. A. Padang, formerly Secretary of the Scientific and Technical Subcommittee of the U.N. Committee on the Peaceful Uses of Outer Space. Attention to educational activities concerning remote sensing is one of the responsibilities of his position.

Recent examples of U.N. activity along this line have been set forth in the report of the Scientific and Technical Subcommittee (A/AC.105/238, February 26, 1979. A regional training seminar on remote sensing applications was held in Nairobi, Kenya from September 4-16, 1978 under the sponsorship of Sweden and the U.N. Environment Program. A regional training seminar was held in Tokyo, Japan from October 23 to November 2, 1978 on the interpretation and analysis of meteorological satellite data.

The U.N. Secretary General made a report on the international remote sensing centers established by the United Nations. There are two centers, one in Rome in connection with the U.N. Food and Agriculture Organization (FAO) and the other in New York in the Centre for Natural Resources, Energy and Transport (CNRET) which functions by cataloging and interpreting remote sensing data, circulating available information, providing impartial advice and assistance for technical projects, and organizing specialized training courses for users, managers and decision makers.

The United Nations sponsored the international seminar on benefits from remote sensing for national development, held in Manila, Philippines, in April 1978 by the Environment Research Institute of Michigan and hosted by the Philippine Government. The purpose of this seminar was "to provide knowledge and understanding of the techniques, methodology and benefits as well as a survey of current results in the use of modern remote sensing technology for resources survey for the benefit of developing countries."

Italy and the Food and Agriculture Organization conducted the third international training course in May and June 1978 on applying remote sensing to tropical forestry. India organized a U.N./FAO training seminar on remote sensing applications for agricultural resources in November 1978 for countries in the Economic and Social Commission for Asia and the Pacific. In May and June of this year, Italy and the FAO held a fourth international training course on remote sensing applications to fisheries. A regional seminar for developing countries was conducted in Ibadan, Nigeria in August 1979 while another is planned for December 1979 in Damascus, Syria. An international training course on remote sensing applications concerning non-renewable resources is scheduled for November 1979 in Argentina.

Plans are already made for 1980 to hold the 16th international symposium on remote sensing of the environment in San Jose, Costa Rica while another will be held in Japan on agricultural and natural resources. Athens, Greece will be the location for 1980 remote sensing tarining courses for land use planning for the benefit of developing countries.

There is a Regional Training Center in Ouagadougou, Upper Volta which is scheduling a training seminar on remote sensing to assist developing countries in monitoring vegetation and agricultural rangeland for semi-arid zones.

The U.S.S.R. has offered a seminar on remote sensing as applied to geology and hydrology and the U.N. Expert on Space Applications, Mr. A. Padang, is authorized to look into this for the 1980 schedule.

I think the United Nations' international and regional plans for using remote sensing data and information are well-conceived and carried out and there is no need for any additional user infrastructure to be developed. They could use additional highly qualified personnel; it is, in fact, remarkable that so much is accomplished by such a small staff. I think it is much better to proceed according to specific projects related to the actual requirements of nations and regions than to add any more layers of institutions. This is particularly true of remote sensing data and information which can apply to such a wide variety of functions that any overall institution based on this technology would cut across well-established functions logically innate to U.N. specialized agencies such as the International Telecommunications Union in space communications, UNESCO in education, the World Meteorological Organization in weather and climate, etc. An additional infrastructure could increase nationalism in the United Nations, unnecessarily and to the detriment of regional and international patterns which

stem naturally from remote sensing technology which has been made available worldwide by the United States. Remote sensing technology has the natural impact of bringing about cooperation among nations in regional and international patterns and we should not interfere with this process which strengthens international understanding and peace.

Question 2. In your view, did the U.N. Conference on Science and Technology for Development, ending last week, serve to advance the understanding of the developing nations about the ways space applications could aid development? Why or why not? What actions do you think the United States could take, through the United Nations, to increase availability of space technology for development?

Answer. It is too early to make an assessment, but I think one U.N. conference on the entire range of subjects included in all science and technology, with space applications as only one element among many, cannot be expected to advance the understanding of developing nations about the ways space applications can aid development. Fortunately, many procedures have been followed by the United Nations to develop knowledge and training about space applications. Those concerning remote sensing have been mentioned in my answer to question 1. Similar methods such as seminars, training centers, regional conferences, reports and demonstration projects have been used for other space applications. Many of these applications are an outgrowth of NASA's programs.

Space science and technology are unique in many ways, particularly in capability to bring about international cooperation and there are risks in combining them with all other scientific and technical subjects. First, unless space activities are dealth with separately, they will lose their priority in terms of budgets and planning for present and future development. Second, many other scientific and technological projects have problems which space activities do not have and commingling can create the danger of grafting onto space some problems unnecessarily borrowed from other areas, e.g., multinational corporations, law of the sea difficulties, foreign aid problems, etc. Third, throwing space into the pot with all other science and technology, and simultaneously focussing on developing nations, makes it difficult to deal with purely space problems which affect all nations, e.g., global monitoring to protect the environments of land, sea, air and outer space.

Fortunately, a separate conference is being planned—the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space—for 1982 and this will afford opportunities to deal with all uses ad exploration of outer space with recognition of its unique capability of contributing to benefits of all mankind. This conference is now being prepared and the Committee on the Peaceful Uses of Outer Space has noted that they should take into account the results of the U.N. Conference on Science and Technology held in Vienna, August 20–31, 1979. Those who attended that conference should transmit any suggestions for improvements to the Department of State.

Meanwhile, it is reassuring to note that the 1979 report of the Committee on the Peaceful Uses of Outer Space (General Assembly Official Records, 34th session, supplement No. 20, A/34/20) contains detailed plans for the second U.N. space conference. The first U.N. space conference was held in Vienna in 1968. Now a working group under the chairmanship of Professor Yash Pal (India) has been established and Mr. Carlos Moreira Garcia (Brazil) has been appointed chairman of an informal drafting group.

A proposal has been made that the U.N. General Assembly adopt a provisional agenda dealing with the state of space science and technology, applications of space sceiene and technology, international cooperation and the role of the United Nations. Detailed plans have been set forth for the preparation and organization of the conference, including staffing, procedures, cost, national papers, final report, etc. This will be a diplomatic conference with emphasis "on agenda items which relate to basic concerns of most Members States." It is intended that not too much time would be taken by "review of programs, presentation of national/international programs, results of scientific experiments" although the "formal part of the conference proceedings might be supplemented by special evening lectures and/or technical expositions." The place of this conference has not yet been decided.

I think the United States has been taking appropriate action in all space-related United Nations organizations to make known the benefits and offer opportunities to other countries for participation in U.S. space activities. For 22 years these opportunities have been extended to all countries. I would not favor unilateral action by the United States through the United Nations in ways additional to those already in use. We also accomplish this objective of making space technology available for development primarily through NASA's International Program

which is authorized by the NASA Act and has led to hundreds of bilateral and multilateral agreements for space cooperation on a multitude of projects since 1958. Opportunities offered to foreign nations, scientists and engineers and international organizations, such as the European Space Agency, involve projects with scientific merit and true sharing in joint undertakings. In fact, the United Nations is one of several major channels for international cooperation in space activities. In addition to the U.S. space program which has consistently been made available for cooperation with other nations and groups of nations, there is the Committee on Space Research (COSPAR) of the International Council of Scientific Unions (ICSU). INTELSAT, the National Oceanic and Atmospheric Admin-is tration, etc. The United States cooperates with the United Nations in furnishing information and assistance to the Committee on the Peaceful Uses of Outer Space, its Legal Subcommittee, its Scientific and Technical Subcommittee, and to the Outer Space Affairs Division, as well as all specialized agencies with space and space-related functions. But projects involving technical operations are best performed by expects in the required disciplines with appropriate controls to ensure efficiency and economy.

Question 3. "Please comment on recommendation 2B of the House Science and Technology's panel on international space activities regarding a policy and methodology for equitable and nondiscriminatory dissemination of Earth observation data. What infrastructure should a Global Resources Information Center, as suggested in the report, have?"

Answer. The United Staes already has a workable policy and method for equitable nondiscriminatory dissemination of data generated by civil Earth-observation space systems in that which has been established for dissemination of information by cooperative institutional arrangements between NASA and the Department of the Interior. This system was established for LANDSAT when designated as "experimental" and anyone may purchase the data and there is no discrimination but complete equity as between users. This system could be called a "Global Resources Information Center" and continue to be operated nationally by the United States with access given to international users as at present. Or it could have some other title. I would not be in favor of turning the whole U.S. remote sensing system over to be operated by an international body as I think the pattern followed by NOAA is a preferable alternative to one which requires operation by different nationalities with the loss of all national control. Furthermore, at this point such action would not be practicable inasmuch as other remote sensing systems are being developed by foreign nations and one of the problems is how to make all systems dovetail technologically. With this problem the United Nations can play a significant role in coordination. There is too much need for remote sensed data and information for federal, state and local governments for us to give up technology which we have successfully developed. Our own states need developing. Consider the "Land Resource Inventory Demonstration Project", a joint cooperative effort of the Pacific Northwest Regional Commission, the U.S. Geological Survey and NASA where Landsat data was applied to resource planning and management decisions in Idaho, Washington, and Oregon. Consider also the Eastern Regional Remote Sensing Applications Center involving 19 north-central and northeastern states. How could U.S. state and regional needs be developed unless the United States continues its own system?

The main problem is not lack of equity or practice of discrimination in disseminating remote sensed data and information in view of the fact that U.S. policy and practice is to make such problem-solving material available worldwide. A problem as perceived by some nations in the United Nations is that they do not like the U.S. policy of free flow of information and ideas and wish to limit access by third parties to information collected over their territories; they are calling for unequal access and discrimination. This is because of overemphasis on fears concerning nonrenewable resources to the point of disregarding all other beneficial uses of remotely sensed data, and while this is an understandable projection from past historical episodes, it is not the only factor in decisionmaking. Many nations favor U.S. policy on remote sensing as now implemented, a system to which they have responded by constructing many ground stations at their own expense.

Another major problem is that although the United States has a policy of providing remotely sensed data through the 1980's, there is a question about the actual hardware being planned to carry out this policy. It requires authorization and appropriation of funds for spacecraft which need a long lead time for construction.

Question 4. "Do you feel there is a need for better coordination of the activities of the various U.N. agencies in space applications? If so, how could better coordination be achieved?"

Answer. I think the United Nations does an outstanding job in space applications, especially considering the limited number of U.N. professional employees working in this field. The staff is small, highly qualified and dedicated to their work which I have observed by attendance at U.N. sessions for many years.

I think the Committee on the Peaceful Uses of Outer Space, its two subcommittees and the Outer Space Affairs Division all feel the need for improved coordination of space activities within the United Nations and are consciously working toward that goal. The Committee found the report of the Secretary General useful in describing the space activities of U.N. organizatons (A/AC.105/223) but the Scientific and Technical Subcommittee pointed out that the U.N. Administrative Committee on Coordination had discontnued the ACC Subcommittee on Outer Space Activities. The Subcommittee's position is that there should be regular annual meetings among space and space-related organizations, inter-agency coordination and also coordination of the two international centers for remote sensing.

The Committee on the Peaceful Uses of Outer Space recognizes that better coordination is needed between the Legal Subcommittee and the Scientific and Technical Subcommittee. In its 1979 report, the Committee includes Annex III, a working paper by Australia, Belgium, Egypt, France, the Federal Republic of Germany, and The Netherlands on methods of work, calling attention to "the need for closer coordination of the work of the Scientific and Technical Subcommittee and the Legal Subcommittee. This lack of contact also impairs the effectiveness of the work of the full Committee." It is proposed that the two subcommittees meet in conjunction on a trial basis, hold joint meetings, and have overlapping sessions to some extent. Each subcommittee would consider each agenda item without a general debate and the sessions should not be longer than three weeks unless "in exceptional circumstances." This proposal has not been adopted. This is only one area where coordination is desired. Trying to coordinate agencies on the basis of their use of information derived from satellites might be compared to coordinating several federal agencies according to their use of the telephone.

Now that the U.N. Conference on the Exploration and Peaceful Uses of Outer Space is being planned for 1982, there is even more reason for coordination of similar functions. The staff needs to find out what UN space activities are going on and what kind of information U.N. agencies need for better performance. If the Secretariat and the Outer Space Affairs Division are adequately staffed, better coordination should be attainable.

But the problem of coordination between the Scientific and Technical Subcommittee and the Legal Subcommittee is more than identifying activities. Integrated and imaginative thinking is required to interrelate space science and technology with legal matters so that laws are not formulated with unnecessary restrictions against the progress of space technology. At the same time, States need to observe guiding legal principles to ensure beneficial results and avoid harmful consequences. The most effective way of coordinating law and science in this area is to ensure the appointment of experts to the Committee and Subcommittee sessions, delegates who are expert in policymaking for multidisciplinary space activities. Many space problems, especially those of remote sensing of the earth by satellites, comprise many factors, not only science, technology and law, but also economic, cultural and political considerations.

Mr. FLIPPO. We're pleased to have with us today Congressman John Breaux, who is chairman of the Subcommittee on Fisheries and Wildlife Conservation and the Environment. He has a long history of interest in the subject of the hearings and has established substantial expertise.

John, we're delighted to have you. Without objection, we will make your full statement a part of the record and you may proceed with your statement.

Mr. BREAUX. Thank you very much, Mr. Chairman. You're very generous in your comments.

[The prepared statement of Hon. John Breaux follows:]

PREPARED STATEMENT OF HON. JOHN BREAUX

Mr. Chairman, I am grateful for the opportunity to appear before your Subcommittee to testify concerning the implications for the United States of the common heritage of mankind, a concept reflected in a broad array of evolving North–South accords, including the Moon Treaty. The common heritage of mankind has become a key component of the Third World program for a redistribution of global wealth from the North to the South. In my view, the realization of this New International Economic Order through the extension of the common heritage concept to the global commons and the celestial bodies beyond, carries grave implications for the long-term economic security of the United States and the other western industrialized countries. This concept, which the United States has long promoted as a lofty ideal, has become a threat to our fundamental economic interests.

The Third World correctly recognizes that, through the foreseeable future, key elements of the world economy will include natural resources, technology and communications. Seeking control of the international economic system, the Third World has asserted that, not only the resources of the celestial bodies, but also deep ocean resources, high technology and the electromagnetic spectrum, are the common heritage of mankind to be utilized for the benefit of developing countries and subject to Third World control.

The natural resources of every nation are subject to its permanent sovereignty, meaning its almost unconditional control. This principle, which is universally recognized, assures the developing countries a substantial degree of power in the world economy, by virtue of the dependency of industrialized countries on such commodities as hydrocarbons and hard minerals. The Third World seeks to extend this dependency by gaining control and reaping the benefits of the resources of the international commons, including most notably, the hard minerals of the international deep seabed. A new Law of the Sea treaty is being negotiated to implement the concept that deep seated resources are the common heritage of mankind. Reflecting that concept, the current negotiating texts provide for Third World control of deep ocean minerals, including manganese, without which steel cannot be produced after terrestrial supplies are exhausted in thirty years, and cobalt, which is essential to the production of high technology items and is subject to interruptions of supply from foreign land-based sources. The negotiating texts establish Third World supremacy in the decision-making process of the envisioned International Seabed Authority. Industrialized countries are denied the assurance of access to deep ocean minerals in the short term and face the prospect of the imposition by the Third World of an absolute and permanent termination of access twenty-five years after the treaty enters into force. In the name of the common heritage, industrialized countries would be required to provide the means for the establishment and operation of an international mining "Enterprise." The Enterprise, which would operate for the benefit of developing countries, would be guaranteed access to one-half of the world's mine-sites and would compete with private companies for access to the other half. Private miners would be required, in accordance with principle of the common heritage, to provide technology, training and prospected mine sites to the Enterprise and technology and heavy financial contributions tod eveloping countries. Unfortunately, the United States has conceded many of these points.

The technology transfer issue extends far beyond the Law of the Sea context. In seeking to obtain natural resources from developing countries, the western industrialized world offers to trade technology. Having assured themselves of control of the natural wealth within their national boundaries and pursuing a program aimed at controlling resources of the international commons, the developing countries seek to achieve control of the conditions under which technology may be transferred. The concept at work is that technology is the "universal heritage of mankind" and that, consequently, developing countries have a right to the technology of industrialized countries on terms that "benefit all mankind." The regime supported by the Third World is calculated to provide maximum benefit to developing country recipients and minimum protection to industrialized country suppliers. The international accord by which this idea is to be implemented is the Code of Conduct on the Transfer of Technology, currently under negotiation. The mandatory transfer of technology in the deep seabeds context is regarded as a precedent for the establishment of more general conditions of access by developed countries to natural resources.

In the area of international communications, the Third World is insisting on the control of international freqency allocations. This, too, is in the name of the common heritage, and is to be effected through the World Administrative Radio Conference.

Mr. Chairman, I am deeply concerned that the Moon Treaty could contribute substantially to the further erosion of the position of the United States and the other western industrialized countries. I am reassured neither by the fact that the development regime for celestial bodies will be negotiated later, nor by the argument that, in the meantime, the United States is protected by its unilateral statements on the record, which have apparently been uncontradicted thusfar. I would like to point out that, in the Law of the Sea context, the United States in the mid-to-late 1960's felt comfortable with a similar situation, but subsequently found that what it perceived to be protections were not protections at all. I would also like to observe that the Moon Treaty contains ambiguities of the same sort that led to serious difficulties for the United States with respect to the deep seabed.

It is worth reviewing some history. In 1967, Malta proposed, based on a notion expressed by representatives of the United States, that the international deep seabed and its resources be declared the common heritage of mankind and be developed for the benefit of all mankind, taking particularly into account the interests and needs of the developing countries. In the years that followed, the United States maintained, at first without opposition, and then without support outside the Western Alliance, that the common heritage would have legal consequences only by virtue of a widely accepted treaty defining the concept and only with respect to States parties to that agreement. In 1969, the Third World voted through the U.N. General Assembly, over the opposition of the industrialized countries, a resolution declaring a moratorium on deep ocean mining, pending entry into force of the envisioned treaty. The trigger was erroneous information that mining was imminent.

In 1970, a resolution, to which no U.N. Member objected, declared the deep seabed and its resources to be the common heritage and set out, with studied ambiguity, the principles of the seabed regime. Subsequently, the entire Third World maintained, with Soviet Bloc support, that the 1970 resolution constituted customary international law as a result of interpretations by the majority of U.N. Members and imposed a universally binding moratorium on ocean mining. Contrary interpretations by the United States and other western industrialized countries both before and following adoption of the resolution were no protection against threats by the Third World in 1978 and this year that mining in advance of a treaty would result in economic retaliation, a breakdown of the Law of the Sea Conference and a general deterioration of North-South relations. I believe that these threats undermined the negotiating position of the United States with respect to the future treaty regime. Perhaps the no-treaty alternative may have lost attractiveness to our negotiators, notwithstanding the forcefully stated U.S. view that ocean mining is a freedom of the high seas which may be exercised subject only to the condition that it not unreasonably infringe other legitimate high seas activities. That is the only way I am able to explain the appalling concessions made by our delegation in the negotiations.

The parallels between the 1970 resolution on the deep seabeds and the 1979 draft Moon Treaty are startling. For the record, I am providing a list of some of the important similarities:

Paragraph 1 of the 1970 resolution states, "The seabed and the ocean floor, and the subsoil thereof, beyond the limits of national jurisdiction . . . as well as the resources of the area, are the common heritage of mankind." Article XI, paragraph 1 of the Moon Treaty states that "The moon and its natural resources are the common heritage of mankind which finds its expression in the provisions of this agreement and in particular in paragraph 5 of this article."

Paragraph 2 of the 1970 resolution states, "The area shall not be subject to appropriation by any means by States or persons, natural or juridical, and no State shall claim or exercise sovereignty or sovereign rights over any part thereof". The Moon Treaty, Article XI, paragraph 2 states, "The moon is not subject to national appropriation by any claim of sovereignty, by means of use or occupation, or by other means." Paragraph 3 of that Article expands upon that concept, as does paragraph 3 of the 1970 resolution. The juridical character of the celestial bodies and the deep seabed and their resources must be viewed as functionally identical, based on the resolution and draft treaty.

Paragraph 9 of the 1970 resolution states that, "On the basis of the principles of this Declaration, an international regime applied to the area and its resources and including appropriate international machinery to give effect to its provisions shall be established by an international treaty of universal character, generally agreed upon." Article XI, paragraph 5 of the Moon Treaty provides, "States parties to this agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the moon as such exploitation is about to become feasible."

Paragraphs 7 and 9 of the 1970 resolution closely track Article XI, paragraph 7 of the Moon Treaty. Notably, the 1970 resolution and the 1979 draft treaty both provide that the future regime shall have as one of its main purposes an equitable sharing by all States of the benefits derived from resource development, and that the interests and needs of developing countries, among others, shall be given special consideration.

Paragraph 4 of the 1970 resolution states, with particularly worrisome ambiguity, "All activities regarding the exploration and exploitation of the resources of the area and other related activities shall be governed by the international regime to be established." Similar ambiguity exists in Article XI, paragraph 8 of the Moon Treaty wherein it is stated that, "All the activities with respect to the natural resources of the moon shall be carried out in a manner compatible with the purposes specified in paragraph 7 . . ." which refers to an "international regime to be established." The ambiguities shared by these provisions are such that the kind of moratorium on deep seabed exploitation which was found to be derived from paragraph 4 of the 1970 resolution could also be found in future to be derived from paragraph 8 of Article XI, of the 1979 draft and applied to the resources of the celestial bodies. This is particularly the case in light of the fact that Article XI, paragraph 4 recognizes the right only to "explore and use" the moon and does not refer to a right to exploit the moon, pending the conclusion of a treaty for exploitation.

If the Third World and Soviet Bloc could contend that universally applicable customary law, establishing a binding moratorium, could spring from a General Assembly resolution, how much more easily could they argue that the same consequences derive from a draft treaty? Such a position taken by the Third World and Soviet Bloc with respect to development of outer space resources could have a seriously adverse effect on our negotiating position on the future exploitation treaty. Investment uncertainties would result and, as has happened with respect to ocean mineral development, the exploitation of outer space resources would be seriously retarded.

I believe, Mr. Chairman, that the long-term economic implications for the United States would be extremely adverse, if the United States were to repeat in the outer space context the mistakes committed with regard to the deep seabed. I strongly believe that the Third World position on the common heritage is not justifiable and should be clearly rejected by the United States in every forum. Only on the bankrupt theory of retributive justice as applied to the post-colonial era could one hope to defend the Third World assault on the Western market economies and the very principles upon which they rely for their security and prosperity. I believe that for the United States to accept the kind of situation presaged by the draft Moon Treaty is to invite a serious erosion of our international community. Like the Law of the Sea Treaty and the Code of Conduct on the Transfer of Technology, the Moon Treaty must be clarified to protect our interests or it must be opposed.

I have long supported the common heritage, but only insofar as it could be interpreted to mean that all sovereign nations have the right to enjoy nondiscriminatory access to the resources of international common areas on a basis that allows competing international economic models to coexist. Access to common resources must not be subject to the political program of any economic bloc. Voluntary assistance to developing countries has a role to play in facilitating the realization of their reasonable economic aspirations. However, coercive measures to compell the transfer of financial and technological wealth to the Third World are unacceptable on any theory.

I would like to request that two articles which I have written relating to the subject of the common heritage be placed in the record. Thank you.

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STATEMENT OF HON. JOHN BREAUX, CHAIRMAN, SUBCOMMITTEE ON FISHERIES AND WILDLIFE CONSERVATION AND THE ENVIRONMENT

Mr. BREAUX. You might wonder why someone who's chairman of a fisheries subcommittee has any interest in appearing before your subcommittee, but hopefully my remarks might clarify that.

I am pleased that you have asked me to testify on a subject that has received far too little congressional scrutiny—the Third World program to achieve over the international economic system largely through such long-term agreements as the Moon Treaty and the Law of the Sea Treaty, both of which are under negotiation. I think it is very important that I share with this committee some of the experiences that I have had with the Law of the Sea as chairman of another subcommittee in Congress, because I believe you will face similar experiences with the Moon Treaty. In my view, the Moon Treaty repeats a tremendous number of errors committed by our negotiators with respect to the Law of the Sea Treaty.

I think this committee has a unique opportunity to learn from history and to take that knowledge and use it so that we do not further compound our errors as the Moon Treaty progresses through the United Nations.

The implications of the so-called doctrine of the common heritage of mankind, which appears in the Law of the Sea Treaty and the Moon Treaty, are of great concern. They may threaten the fundamental economic security of the Nation in the long term.

The Moon Treaty was not objected to by the United States; we have not yet initialed it, as I understand it; but we have allowed it to proceed to the First Committee of the United Nations, from the Outer Space Committee, thereby more or less acquiescing in the negotiated text. I think that is an absolute, horrible mistake.

The common heritage of mankind doctrine has become a major component of the Third World's program for a redistribution of global wealth from the North to the South. In my view, the realization of this New International Economic Order through the extension of the common heritage concept to the global commons and the celestial bodies beyond is incompatible with the national interest. The concept, which the United States has long promoted as a lofty ideal, has been implemented by the developing countries in a manner that undermines market principles of economics and subverts the sanctity of industrial property. The common heritage extends to the global context, the planned economy model, a model which has proved itself to be highly undesirable in every nation in which it has appeared. Competition is stifled, the profit incentive denied and the means and resources of production are owned by all—ultimately for the real benefit of none.

The Third World correctly realizes that, through the foreseeable future, key elements of the world economy will include natural resources, technology, and communications. Seeking control of the international economic system, the Third World has asserted that, not only the resources of the celestial bodies, but also the deep ocean resources, high technology and the electromagnetic spectrum are the common heritage of mankind, to be utilized for the benefit of all mankind, which is to say, to be owned collectively and used primarily for the

benefit of developing nations and subject to one-nation, one-vote control.

The natural resources of every nation are subject to its permanent sovereignty, and that's something that's historically correct, meaning its almost unconditional control. This principle, which is universally recognized, assures the developing countries a substantial degree of power in the world economy by virtue of the dependency of industrialized nations on such commodities as hydrocarbons and hard minerals, and the Third World seeks to extend this dependency by gaining control and reaping the benefits of the resources of the international commons, including most notably, the hard minerals of the international deep seabed. Reflecting the concept that deep seabed resources are the common heritage of mankind, the current Law of the Sea negotiating texts provide for Third World control of deep ocean minerals, including manganese, without which steel cannot be produced after our earth supplies are exhausted in 30 years, and cobalt, which is essential to the production of high technology and is subject to interruptions of supply from foreign land-based sources. Specifically, the negotiating texts in the Law of the Sea Treaty establish Third World supremacy in the decisionmaking process of an envisioned International Seabed Authority. Industrialized countries like the United States are denied the assurance of access to deep ocean minerals in the short term and face the prospect of the imposition by the Third World of an absolute and permanent termination of access 25 years after the treaty enters into force.

Under the slogan of common heritage, industrialized nations would be required to provide the means for the establishment and operation of an international mining "enterprise" to be operated by developing countries for their own benefit. A similar regime could be applied to space resource exploitation, because both the Moon Treaty and the deep seabed part of the Law of the Sea Treaty are based on the same principle—the common heritage of mankind.

The technology transfer issue extends far beyond the law of the sea context. In seeking to obtain natural resources from developing countries, the Western industrialized world offers to trade technology. Having assured themselves of control of the natural wealth within their national boundaries and pursuing a program aimed at controlling the resources of the international commons, the developing countries seek to achieve control of the conditions under which technology may be transferred. The concept at work is that technology is the "universal heritage of mankind" and that, consequently, developing countries have a right to the technology of industrialized countries on terms that "benefit all mankind." The regime supported by the Third World is calculated to provide the maximum benefit to developing country recipients and minimum protection to the industrialized country which is supplying it. The international accord by which this idea is to be implemented is the Code of Conduct on the Transfer of Technology, currently under negotiation.

Mr. Chairman, I am really deeply concerned that the Moon Treaty could contribute substantially to the further erosion of the position of the United States and other industrialized Western countries. I am reassured neither by the fact that the development regime for celestial bodies will be negotiated later, nor by the argument that, in the

meantime, the United States is protected by its unilateral statements on the record, which have apparently been uncontradicted so far.

I would like to point out that, in the Law of the Sea context, the United States in the mid-to-late 1960's felt comfortable with a similar situation, but subsequently found that what it perceived to be protections were not protections at all. I would like to also observe that the Moon Treaty contains ambiguities of the same sort that led to the serious difficulties for the United States with respect to the deep seabed.

I will skip the part of my testimony, Mr. Chairman, which is a historical background on how the common heritage of mankind doctrine was developed with regard to the Law of the Sea, how it started off just like it is starting off in the Moon Treaty, as being a rather innocuous phrase, but how that became interpreted to mean what we originally thought it meant, and what we said it meant and no one contradicted in the beginning. But now the Law of the Sea common heritage doctrine has ended up meaning in the treaty negotiating tests exactly what the Third World nations have decided that it would have to mean because of their majority position and their support by the Soviet Union and others.

I would point out that on page 7 of my statement I cite a number of examples where the language in the key Law of the Sea resolution which provided the basis for the deep seabed negotiating texts is almost identical to the language in the Moon Treaty. There is very little distinction between the two, except that one is dealing with deep seabed and the other is dealing with the Moon and other celestial bodies.

So, I think I can find a very similar pattern on how the two treaties are being developed, and I find very little relief in the statements by some who have negotiated this treaty that, "Well, this means in fact, what we believe it means." It might mean now what we think it means, but after a couple of years down the road I think we'll find out that it means what the Third World says it means and that the long-term implications are very much adverse to the interests of the United States.

I have long supported the common heritage, but only insofar as it could be interpreted to mean that all sovereign nations have the right to enjoy nondiscriminatory access to the resources of international economic models to coexist.

What that simply means in my mind is that when we talk about the common heritage we mean that everybody, every nation of the world, all peoples of the world have the right to go out to explore, have the right to exploit, under an equitable set of rules and regulations, these particular areas. That's what common heritage, I think, means. But others think that it means a great deal more than that, that it means some kind of a sharing of the resources of the world on a basis planned by one economic group, the Third World, and that somehow because they do not have the technology that we should be compelled to transfer it to them on their terms, as the price of access to common resources.

That I do not think is what we intend, and I think that this Congress, and particularly this committee because of your areas of jurisdiction, have a unique opportunity not to make the mistake that some of us have made in other areas, I might add before I got to Congress. Now we find

ourselves in a totally unacceptable position with regard to the oceans and what common heritage means in that forum. Don't let the Science and Technology Committee and the other committees in the other body make the same mistake we did.

I would suggest very strongly that this committee, at the very least, draft a letter from the members to the U.S. negotiating team for the Moon Treaty or pass a resolution and state very clearly that while we believe in the common heritage, the Moon Treaty in its present form is totally unacceptable. We must make that position clear now, because 5 years from now we won't have that opportunity. Five years from now there will be so much history written as to what the Third World means about the common heritage that it will be much too late.

I can't think of anything other than technology right now that we lead the rest of the world in except maybe agriculture and agriculture is a product of technology. We're losing our lead right and left. The only thing that we have much superior to other nations now is technology, and if we agree to this common heritage doctrine in the Law of the Sea Treaty and the Moon Treaty now we'll end up giving away our technology, and get nothing in return. That's a bad principle, and I just wanted to make this committee aware of it.

I thank the chairman.

Mr. FLIPPO. John, I want to thank you for taking the time out of your very busy schedule to come and share with us your experience in this very important area. I'm sure it will be of great benefit not only to the members of this committee, but to the Members of the entire House, and we will be looking very carefully at your recommendations, I'm certain of that.

Mr. BREAUX. Thank you, Mr. Chairman.

I would like one other thing, if I could, in addition to making my statement for the record. I have written two articles on the common heritage, what it means and what I think it should mean, and I would like, if it is permissible and within the constraints of the committee budget, to have them included in the record.

Mr. FLIPPO. We will certainly insert those. They're well written articles and they will make a great contribution.

Mr. BREAUX. Thank you very much.

Mr. FLIPPO. Thank you.

[The material to be provided is as follows:]

Technology Transfer: A Case Study of the Inequity of the New International Economic Order

Congressman John Breaux
Chairman, House Subcommittee on Fisheries and Wildlife Conservation and the Environment

Transfer of technology from the North to the South is a key component of the New International Economic Order (NIEO), which is aimed at a fundamental redistribution of global wealth. Third World efforts to implement its view of the nature of technology and the proper conditions of its transfer provide a case study in the basic inequity of the NIEO.

It is obvious that the fundamental trade in the North-South economic equation is, and will likely remain, that of technology for natural resources. The developing countries insist and the developed countries agree that States have "permanent sovereignty" over their natural resources. However, the Third World maintains with no less conviction that the technology of the developed countries is the "universal heritage of mankind." The inequity reflected in the developing country position on technology subverts the mutuality of interests without which future global economic relations between the now rich and the now poor cannot succeed. Only on the bankrupt theory of retributive justice as applied to the post-colonial era could one hope to defend the dichotomy of the Third World view and as a matter of general policy, the developed countries reject it.

The concept of permanent sovereignty over natural resources is confirmed in North-South declarations and universal international agreements. the notion of technology as the universal heritage of mankind is being pressed by the Third World, and resisted by the developed countries, in the global negotiations on a Code of Conduct on the Transfer of Technology. At the Third United Nations Conference on the Law of the Sea (UNCLOS III), however, the North is acquiescing not only in the extension of permanent sovereignty over vast ocean resources within 200 miles of the coasts, but also in the implementation of the universal heritage of mankind by the mandatory transfer of marine mining technology for the benefit of developing countries. The inequity of the New International Economic Order is, thus, becoming more than merely a matter of theoretical concern.

While it could be argued that the principle of permanent sovereignty over natural resources derives from the sovereign equality of States and the corollaries of territorial integrity and political independence guaranteed by the U.N. Charter, it is equally valid to regard permanent sovereignty over natural resources as an aspect of human rights reflected in the International Covenant on Economic, Social and Cultural Rights and the International Covenant on Civil and Political Rights. Those Covenants provide that:

> All peoples have the right of self-determination. By virtue of that right they may freely determine their political status and freely pursue their economic, social and cultural development.
>
> All peoples may, for their own ends, freely dispose of their natural wealth and resources without prejudice to any obligations arising out of international economic cooperation, based upon the principle of mutual benefit, and international law. In no case may a people be deprived of its own means of subsistence.

Resolution 1803 (XVII) adopted on December 14, 1962 by the U.N. General Assembly contains detailed provisions relating to permanent sovereignty over natural resources. The measure was adopted with 87 votes in favor (including that of the United States), 2 against and 12 abstentions.

The resolution declares that, "The right of peoples and nations to permanent sovereignty over their natural wealth and resources must be exercised in the interest of their national development and of the well-being of the

people of the State concerned." It is stated that, "The free and beneficial exercise of sovereignty of peoples and nations over their natural resources must be furthered by the mutual respect of States based on their sovereign equality."

It is declared, further, that peoples and nations shall freely determine the authorization, restriction, or prohibition of all activities of exploration, development, and disposition of their resources. Nationalization, expropriation, and requisitioning for reasons of public utility, security, or the national interest are recognized, subject to appropriate compensation, in accordance with the rules in force in the State taking the measure in the exercise of its sovereignty, and in accordance with international law.

Profits from transactions involving natural resources "must be shared in the proportions freely agreed upon, in each case, between the investors and the recipient State, due care being taken to ensure that there is no impairment, for any reason, of that State's sovereignty over its natural wealth and resources." Economic and technical assistance is to have the aim of furthering independent national development and to be based upon respect for the sovereignty of States over their natural resources.

The resolution states that the violation of the rights of peoples and nations to sovereignty over their natural wealth and resources is contrary to the spirit and principles of the Charter of the United Nations and hinders the development of international cooperation and the maintenance of peace. States are obligated to respect that sovereignty in accordance with the U.N. Charter and the principles set forth in the resolution.

It is, therefore, clear that the concept of permanent sovereignty over natural resources, which protects the developing country side of the North-South economic equation, is enshrined in important international instruments. It is, indeed, a principle which the developed countries have willingly accepted.

It is, however, by no means the case that the North, for its part, has been adequately protected. On the contrary, the South has made major efforts to attempt to assure that the protections available to it for natural resources are not extended to the developed countries for technology and its transfer. In the Code of Conduct negotiations, the Tentative Composite Draft Text for the Code reflects a wide divergence between the developed country and developing country views concerning technology transfer.

The "Group of 77"* position is broadly reflected in a provision of the Preamble, which states that, "technology is the key to the progress of mankind and . . . all peoples have the right to benefit from . . . technology, in order to improve their standards of living." The Preamble also reflects the Group of 77 view that the development and transfer of technology is "a decisive step . . . towards the establishment of a new international economic order." Furthermore, the Third World position calls attention to "the need to improve the flow of technological information, and in particular information on the availability of alternate technologies, and on the selection of appropriate technologies suited to the specific needs of the developing countries". Developed States accept these ideas, but reject many implementing concepts promoted by the Group of 77.

In the view of the Group of 77, the Code of Conduct should be legally binding and should effect a substantial curtailment of protections of proprietary information and of restrictions on the transfer of technology. An objective and principle of the Code, they believe, should be "to eliminate restrictive practices which arise out of or affect the transfer of technology". Further, the developing countries maintain that the new Code should "establish an appropriate set of guarantees for supplying and acquiring parties to transfer of technology transactions taking fully into account the weaker position of acquiring parties in developing countries". The developed countries oppose these positions.

In a key operative provision of the November 1978 draft of the Code, the differences of view between the developed and developing countries are particularly well illustrated. The developing countries proposed that the provision should state that, in exercising their right to adopt laws and policies with respect to the transfer of technology, States should "ensure an equitable balance between the needs of economic and social development, particularly of the developing countries, and the rights granted by industrial property." The developed States, on the other hand, felt that the provision should read, "ensure effective protection of industrial property rights and other rights of parties involved in the transfer of technology". How an "equitable balance" was to be determined was the problem; it was clear that "effective protection" of rights would be unlikely.

At the latest negotiations, which ended in March of this year, a compromise was adopted, as follows:

> Each country when adopting legislation on the protection of industrial property should have regard to its national need of economic and social development, and should ensure an effective protection of industrial property rights *granted under its national law and other related rights recognized by its national law.* (Emphasis supplied).

I believe that this compromise merely papers over the differences of view on the fundamental issue. The ambiguity allows each side to claim that its basic position is preserved.

The developing and developed countries agree that in exercising the right to adopt laws and policies respecting transfer of technology, the State involved should have equitable regard to the legitimate interests of the supplying and acquiring parties. The two sides disagree, however, on the treatment of international law, which is of

Ed. Note: Although maintaining its original numerical designation, the Group now numbers about 120 developing nations

paramount interest to supplying States. The developed countries would have the Code provide that national laws and policies must be in accordance with international legal obligations. The Third World, however, holds that the Code ought to provide that such obligations should merely be taken into consideration.

The Group of 77 rejects protections of confidentiality through restrictions on sales, representation, or manufacturing agreements. The Group opposes restrictions on research and development where necessary to protect the composition of secret ingredients. The "77" cannot accept restrictions on exports, even where the recipient country may not protect industrial property rights. Nor will the Group of 77 agree to certain important protections for trademarks. The Group wants a lapse on the protection of all secret data after an "adequate" time after its provision to the acquiring party.

The Group of 77 rejects restrictions on the scope, volume, capacity of production, or field of activity and any requirement on the potential technology recipient to use trade names. On the other hand, the developing countries insist upon an obligation on the part of the technology supplier to "be responsive to the economic and social development objectives of the . . . acquiring party".

As far as the prevailing laws are concerned, the Group of 77 maintain that they must be those of the acquiring State and that any choice of laws clause is invalid. The developed countries, on the other hand, would have it specified that the choice of laws would be freely negotiated.

According to the Group of 77, the parties to a transfer are to negotiate in good faith to agree to "fair and reasonable terms and conditions." The Group maintains that the price or consideration to be charged must "be non-discriminatory and no less favorable than the consideration usually required by the supplying party or other technology suppliers for similar technologies under similar circumstances." The developed countries of the western world, on the other hand, would prefer that the Code provide that the parties should negotiate in good faith and with the aim of reaching an agreement "within a reasonable time and upon fair and reasonable commercial terms and condition." In the Group of 77 position, there is a requirement for "fair and reasonable terms and conditions"; in the western position, "commercial" terms and conditions are called for. What is "fair and reasonable", without a link to commercial reality, can and would be defined in terms of the political and economic development goals of the acquiring party.

From the foregoing it is clear that the South is making a serious effort to implement its notion that it has a right to technology developed and held by the North under conditions which are heavily weighted in favor of acquiring parties in developing countries. Having secured their virtually absolute control over their natural resources, the less developed countries are carrying out a major assault on the protections afforded technology held by the developed countries. The North is resisting this assault in the Code of Conduct negotiations, thereby defending the basic viability of the North-South trade of technology for natural resources.

At the Third United Nations Conference on the Law of the Sea (UNCLOS III), the developing country positions of principle on natural resources and technology have both made considerable headway, in each case with support, however reluctant in some areas, from the developed countries. The South has gained acceptance by the North of 200-mile economic zones in which the coastal States (most of which, though not the largest of which, are developing countries) have sovereign rights over all natural resources. The North has also accepted the concept that the mineral resources of the international deep seabed are the "common heritage of mankind," to be developed primarily for the benefit of the Third World. Those minerals include manganese, cobalt and nickel, each of which is vital to the economies of the industrialized nations. Without manganese, there is no steel; without nickel and cobalt, high quality alloys cannot be produced. Many important ocean resources otherwise available to be freely exploited by technologically advanced States entirely for their own benefit are thus to be subject to a new treaty regime calculated to respond largely to the interests of the developing countries.

The Third World has also obtained agreement from the developed countries on obligations to facilitate the transfer of marine technology from the North to the South. More importantly, the North has acquiesced in mandatory transfer of ocean mining technology to the Enterprise, an international mining operator to be created by the new Law of the Sea (LOS) treaty, to develop deep seabed minerals primarily on behalf of the developing countries. The demand for mandatory transfer of technology derives, of course, from the broader program of the New International Economic Order, reflected significantly in the Group of 77 positions in the Code of Conduct negotiations. The concession by the developed countries at UNCLOS III is inconsistent with their general policy which denies the existence of a developing country's right to developed country technology. The precedent which is thereby established in the ocean mining negotiations has serious implications for the wider talks on the Code of Conduct.

At UNCLOS III, the Third Committee has jurisdiction over the general subject of transfer of marine technology. It has, however, approached the issue in a casual manner.

Nevertheless, the provisions in the Conference negotiating texts deriving from the talks in that Committee probably reflect Conference consensus.

It is worth noting some of the more important concepts in these texts. "States directly or through appropriate international organizations, shall cooperate within their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions." Here, as in the Group of 77 alternative provisions for the Code of

Conduct on Transfer of Technology, fair and reasonable terms and conditions are specified, without reference to commercial realities. The text also provides that, "States shall promote the development of marine scientific and technological capacity of States which may need and request technical assistance in this field, particularly developing States . . . with a view to accelerating the social and economic development of the developing States." Once again, an obligation is placed upon technologically advanced States to transfer technology for the purpose of contributing to the efforts of the less developed countries to improve their economic and social standing in the international community.

Nowhere in the text is there mention of an obligation on the part of recipient States to protect proprietary information of the supplying parties. Typical of those provisions which relate to this issue is one which states that, "States . . . shall have proper regard for all legitimate interests including, *inter alia*, the rights and duties of holders, suppliers and recipients of marine technology." "Proper regard" is not satisfactory protection.

It is clear from these provisions and from the more detailed language of others in the Third Committee text, that the developed countries of the West fare very poorly under the envisaged system. Indeed, it is not only the developing countries that may claim a right to the transfer of technology from developed countries, but also technologically less developed, although by no means Third World countries, of the East. It is difficult to regard this kind of result as acceptable.

Serious negotiations on technology transfer have occurred in the First Committee, which deals exclusively with deep seabed mining. Those talks have resulted in relatively detailed provisions on the transfer of ocean mining technology. Third World success in promoting its concept of technology as the universal human heritage is clearly reflected in these provisions.

The First Committee provisions on the transfer of technology reflect the standard, "fair and reasonable terms and conditions" in the main articles of the negotiating texts, although in the annexed provisions the standard, "fair and reasonable commercial terms and conditions" appears. One may still ask, however, how mandatory transfer of technology can be reconciled with commercial terms and conditions. I am persuaded that third party arbitration, for which the texts make provision, does not solve the fundamental problem. It is also worth noting that an operator who gains a contract from the International Seabed Authority to mine the deep seabed must transfer his technology to the Enterprise (the operating arm of the proposed Authority), if the Enterprise is unable to obtain "the same or equally efficient and useful technology on the open market and on fair and reasonable terms and conditions." Here again, the term, "commercial," does not appear.

It is not the case that the obligation of the contractor extends only to the Enterprise. He must, in addition, undertake the same obligations to transfer technology for the benefit of a developing country or group of developing countries which have applied for a contract in certain areas of the deep seabed. It is worth noting, however, that there would be protection against third parties receiving the technology through a subsequent transaction with the initial recipients.

It is further provided in the First Committee text that in the event the Enterprise is unable to obtain necessary technology to commence the processing of minerals it recovers from the deep seabed, parties to the treaty whose nationals are engaged in ocean mining and other parties having access to such technology, must "take effective measures to ensure that such technology is made available to the Enterprise on fair and reasonable commercial terms and conditions." It is not certain how this obligation could be fulfilled, although it does imply possibly substantial expense and intervention by governments in the marketplace. It is worth noting, in addition, that this obligation applies not merely to sea-based processing, but also to land-based processing and thereby goes far beyond the bounds of the Law of the Sea treaty as it has been conceived heretofore.

For the purposes of mandatory transfer, technology is defined in the LOS negotiating text as "equipment and technical know-how, including manuals, designs, operating instructions, training and technical advice and assistance necessary to assemble, maintain and operate a system for the exploration for and exploitation of the resources of the Area and non-exclusive legal right to use these items for that purpose." The definition is, therefore, quite comprehensive. The burden which is placed upon the contractor is considerable. There is little doubt that the Third World is not prepared to be satisfied with merely a conceptual victory on mandatory transfer; on the contrary, it is intent upon actually receiving the technology and making effective use of it.

The position of the United States delegation to the LOS Conference in accepting mandatory transfer of ocean mining technology to the Enterprise has been predicated on the notions—all of them erroneous, in my view—that the ocean mining regime is unique, that mandatory transfer of ocean mining technology is, therefore, not a precedent for future international arrangements, that broader interests in the successful conclusion of a Law of the Sea treaty justify this concession, and that mandatory transfer can be implemented in a commercially viable manner.

I believe that it is self-evident, however, that the ocean mining regime can be unique only if all the major forces in the life of the international community agree to regard it so. But there has been no such agreement. Numerous statements on the record at the Law of the Sea Conference by the developing countries reflect their strongly held view that the ocean mining regime is the prototype for other regimes to develop common resources and otherwise to utilize common areas and that the economic components of that regime are key elements at the vanguard of the New International Economic Order. In that context, the mandatory transfer of ocean mining

technology must be regarded as a precedent for future arrangements to transfer other kinds of technology.*

In response to the argument that broader interests in achieving a new Law of the Sea treaty justify acceptance of mandatory transfer of technology, I must reply that broader interests than those in this treaty demand rejection of the concept. The very fabric of global economic relations, including the ability of the industrialized countries to strike the fundamental bargain of technology for natural resources, is being challenged in the deep seabed negotiations. The stakes are far too large to permit a concession.

Finally, I believe that mandatory transfer should be regarded as a forced sale. Cruel experience shows that forced sales are rarely consummated on commercial terms and conditions. But even if mandatory transfer in the ocean mining regime could be devised in a way to prevent such a result, it would be highly undesirable, insofar as it would represent a very poor model for future international arrangements.

Of course, the United States could reject the deep seabed bargain ultimately, either by refusal to sign the treaty or by refusal to ratify it. But the Third World has sought to foreclose the option. The developing countries (with East Bloc support) maintain that, because the resources of deep seabed are the common heritage of mankind to be exploited primarily for the benefit of the Third World, ocean mining by the industrialized States outside of a new, widely acceptable Law of the Sea treaty reflecting that principle is unlawful. The Third World and Soviet Bloc insist that the common heritage of mankind is a rule of customary law binding on all States. The United States accepts the common heritage as a political concept reflected in a 1970 U.N. General Assembly declaratory resolution to which we agreed, but holds that the concept will have legal consequences only when a new Law of the Sea treaty enters into force. We maintain, quite correctly I think, that ocean mining is a freedom of the high seas and that the right of sovereign States to develop the deep seabed cannot be overturned without their consent.

A new Law of the Sea treaty must, in my view, protect fundamental United States interests, among which a most important one relates to maintenance of fundamental equity in North-South relations. I believe that the United States should reject any treaty which is destructive of that interest. A treaty which compels acceptance of mandatory transfer of technology as a price for access to raw materials fails to meet the test. One must bear in mind, as well, that acceptance of the ocean mining bargain would be in the context of Third World denial of the ability of the United States to opt out at future time and unilaterally to exploit deep ocean resources. There would be a bargain, but wholly on the terms of the developing countries. The basic inequity of the New International Economic Order would be manifested and its extension to other areas encouraged, if not assured. The Code of Conduct negotiations, among others, would be adversely affected accordingly.

The United States should insist that its technology is subject to its permanent sovereignty and that fundamental equity demands recognition by the developing countries of that principle. For the United States to do otherwise, indeed, for it to accept a contrary principle even in the limited context of UNCLOS III, is to invite a serious erosion of our material, legal and equitable position in the international community.

*Ed. Note: For instance, the very subject of this special issue—the U.N. Conference on Science and Technology for Development.

Congressman John B. Breaux of Louisiana was sworn into office as a member of the 92nd Congress to fill the unexpired term of Louisiana Representative Edwin Edwards on October 12, 1972. He has been reelected to Congress four times since 1972. Currently Mr. Breaux serves as a senior member of the House Merchant Marine and Fisheries Committee and is Chairman of that Committee's Subcommittee on Fisheries and Wildlife Conservation and the Environment. He also serves as a member of the House Public Works and Transportation Committee.

With the convening of 96th Congress, Mr. Breaux became Dean of Louisiana's House Delegation. In addition, he has been elected to the prestigious Democratic Policy and Steering Committee and the House Select Committee on Committees, which is charged with updating the entire House Committee system. He is also Secretary of the Executive Committee of the Democratic Research Organization.

Mr. Breaux received his B.A. in political science from the University of Southwestern Louisiana and a Juris Doctor degree in law from Louisiana State University. After receiving his law degree, he entered into practice with the Baton Rouge law firm of Brown, McKernan, Ingram and Breaux. In 1968, he joined the staff of Congressman Edwin W. Edwards.

The Diminishing Prospects for an Acceptable Law of the Sea Treaty

JOHN BREAUX*

I. THE CALCULUS OF ADVICE AND CONSENT

A. *Statement of the Problem*

Out of the complexities of the deep seabed negotiations at the Third United Nations Conference on the Law of the Sea (Conference),[1] have emerged, with striking clarity, the issues upon which a future treaty would likely stand or fall in the U.S. Senate. Assured access by the United States to deep seabed resources, institutional arrangements consistent with fundamental U.S. political, economic, and strategic interests, and economic provisions compatible with free market precepts are likely to be the essential conditions for Senate approval. Other aspects of the treaty might provide some benefits to navigational and environmental interests; however, the deep seabed regime will be the decisive factor in Senate consideration of the treaty, because the long-term national interest requires assured access to deep seabed minerals and because institutional and economic aspects of the deep seabed regime would create significant precedents for future international arrangements.

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1. The Third United Nations Conference on the Law of the Sea was convened in 1973, pursuant to G.A. Res. 2750, 25 U.N. GAOR, Supp. (No.28) 25, U.N. Doc. A/8028 (1971). The Conference followed almost six years of discussions in the Plenary and First Committees of the U.N. General Assembly, in the Ad Hoc Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction (established by G.A. Res. 2340, 22 U.N. GAOR, Supp. (No.16) 14, U.N. Doc. A/6716 (1967)), and in the standing Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction (established by G.A. Res. 2467, 23 U.N. GAOR, Supp. (No.18) 15, U.N. Doc. A/7218 (1968)). The two committees dealt primarily with the deep seabed issue. *See* Report of the *Ad Hoc* Committee to Study the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction, 23 U.N. GAOR (Agenda Item 26), U.N. Doc. A/7230 (1968); Reports of the Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction, 24 U.N. GAOR, Supp. (No.22), U.N. Doc. A/7622 (1969); 25 U.N. GAOR, Supp. (No.21), U.N. Doc. A/8021 (1970); 26 U.N. GAOR, Supp. (No.21), U.N. Doc. A/8421 (1971); 27 U.N. GAOR, Supp. (No.21), U.N. Doc. A/8721 (1972); 28 U.N. GAOR, Supp. (No.21), U.N. Doc. A/9021 (1973). The Law of the Sea Conference, however, has dealt with virtually the entire range of oceans issues. *See generally* Official Records of the Third United Nations Conference on the Law of the Sea.

B. *The Issue of Access*

The minerals found in the deep seabed include manganese, cobalt, and nickel: commodities essential to steel production, and consequently, vital to the national economy and security.[2] The United States lacks significant domestic sources of supply for these minerals.[3] In the cases of manganese and cobalt, both essential to the manufacture of high quality steel alloys, foreign supply sources are undependable.[4] Moreover, it appears that terrestrial manganese may be exhausted within thirty years.[5] Importation of nickel is more reliable, but is so extensive as to have a significant adverse effect on the national balance of payments.[6] Assured access to deep seabed mineral deposits could virtually satisfy the U.S. requirements for manganese and cobalt and could contribute substantially to meeting the nation's demand for nickel.[7] The national interest in that access is, therefore, clear.

Institutional aspects of the deep seabed regime, which is currently under negotiation, have a direct bearing on access. Rights to develop deep seabed resources would be granted or denied by the International Sea-Bed Authority (Authority).[8] Because its power probably would entail an element of discretion, the decisionmaking process in the Authority would be highly political. Thus, the relative influence of States in the system of governance could be critical to the issue of access of their enterprises to deep seabed resources. A system of governance dominated by a one-nation, one-vote Assembly,

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2. *See* CONGRESSIONAL RESEARCH SERVICE, 94TH CONG., 2D SESS., OCEAN MANGANESE NODULES 48-53 (Comm. Print 1976) [hereinafter cited as NODULES]. Significant amounts of copper also are contained in manganese nodules. Although copper is a large income producer, copper from nodules would not be vital to national security. *Id.* at 30.

3. H.R. REP. NO. 588, PT. 1, 95th Cong., 1st Sess. 17-18 (1977) [hereinafter cited as HOUSE REPORT].

4. NODULES, *supra* note 2, at 51-53.

5. S. REP. NO. 1125, 95th Cong., 2d Sess. 33 (1978) [hereinafter cited as SENATE REPORT].

6. NODULES, *supra* note 2, at 48-49.

7. *Id.* at 47.

8. The International Sea-Bed Authority would be the international organization through which States that are parties to the Law of the Sea Treaty would administer deep seabed mining. Informal Composite Negotiating Text art. 155(1), 8 Official Records of the Third United Nations Conference on the Law of the Sea, U.N. Doc. A/CONF.62/WP.10 (1977) [hereinafter cited as ICNT]. The ICNT is an informal negotiating text, without status as an agreed draft treaty. Explanatory Memorandum by the President of the Conference, 8 Official Records of the Third Conference on the Law of the Sea 65, U.N. Doc. A/CONF.62/WP.10/Add.1 (1977). This and similar Conference documents do not represent principles of existing law. *See, e.g.*, Fisheries Jurisdiction (United Kingdom v. Iceland), [1974] I.C.J. 3, 23-24; Fisheries Jurisdiction (Federal Republic of Germany v. Iceland), [1974] I.C.J. 175, 192.

as contemplated by the Third World and reflected in the Conference negotiating texts,[9] would cast serious doubt on assured access by developed States.

The Enterprise, the operating arm of the Authority, would compete against private and State companies in the contemplated dual or parallel system and thereby could affect their access to the deep seabed.[10] Establishing and maintaining a competitive balance therefore appears crucial, but the Conference negotiating texts fail to achieve it. As the recipient of funding and technology provided to the Authority by States and private enterprises, as a tax-exempt international organization, as the beneficiary of inevitable institutional bias in the Authority, and for other reasons, the Enterprise would enjoy a privileged competitive position.[11] As a result, access by State and private enterprises to deep seabed resources could be substantially prejudiced, and perhaps destroyed.

The economic elements of the deep seabed regime would be of great significance to the issue of access. As reflected in the negotiating texts and the dominant trends of the Conference, the more important economic features of the regime include:

(1) Mandatory transfer of technology from private and State holders to the Enterprise, and perhaps, to developing countries;[12]

(2) A ceiling on seabed minerals production to protect land-based minerals producers;[13]

(3) Representation by the Authority of deep seabed production in international commodity arrangements;[14]

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9. The Council and Assembly, the primary components of the system of governance, are provided for in ICNT, *supra* note 8, arts. 156-161.

10. The general provisions relating to the Enterprise are contained in ICNT, *supra* note 8, art. 169 and Annex II.

11. ICNT, *supra* note 8, arts. 144, 150, 151(8), 169(4), 173(3), 184, Annex II, para. 4, Annex III, paras. 10, 11(c). Following the 1978 Geneva Session of the Conference, alternative negotiating texts were produced. Revised Suggested Compromise Formula by the Chairman of Negotiating Group 1, U.N. Doc. A/CONF.62/NG.1/10/Rev.1 (1978) [hereinafter cited as Alternative Texts], *reprinted in* 2 STIFTUNG WISSENSCHAFT UND POLITIK, FORSCHUNGSINSTITUT FÜR INTERNATIONALE POLITIK UND SICHERHEIT, DOKUMENTE DER DRITTEN SEERECHTSKONFERENZ DER VEREINTEN NATIONEN - GENFER SESSION 1978, at 704 (1978). The Alternative Texts show progress toward consensus, but do not prejudice the particular positions of any delegation. These provisions, like those of the ICNT, are merely a basis for further negotiations. The Alternative Texts provisions pertinent to the issues at hand are arts. 144, 150, and Annex II, para. 4.

12. ICNT, *supra* note 8, arts. 144, 151(8), Annex III, para. 4; Alternative Texts, *supra* note 11, arts. 144, 150, Annex II, paras. 4, 5.

13. ICNT, *supra* note 8, art. 150(1)(*g*)(B); Alternative Texts, *supra* note 11, art. 150*bis*(2).

14. ICNT, *supra* note 8, art. 150(1)(*g*)(A); Alternative Texts, *supra* note 11, art. 150*bis*(1).

(4) Quotas or similar measures to establish limits on the number of mine sites which may be held by each State and its public and private enterprises;[15]
(5) A future moratorium on ocean mining of manganese nodules by State and private enterprises, pending successful renegotiation of the deep seabed regime;[16]
(6) Revenue-sharing with the Authority by private and State enterprises for the direct benefit of the Enterprise and developing countries;[17]
(7) Immunity of the Enterprise from national taxation;[18]
(8) State funding of the Enterprise shortly after the treaty becomes effective;
(9) A "banking system" through which State and private operators would be required to provide prospected or explored mine sites to the Authority for the direct benefit of the Enterprise or developing countries;[19]
(10) A moratorium on development of non-manganese nodule minerals, pending establishment of an agreed regime for them.[20]

A treaty containing these provisions would render significant access doubtful, at best. The prospects for Senate approval of the treaty are reduced accordingly.

C. *The Issue of Precedents*

The precedential impacts of the deep seabed regime have profound implications for the economic, political, and strategic inter-

15. ICNT, *supra* note 8, Annex II, para. 5(1).

16. ICNT, *supra* note 8, art. 153(6); Alternative Texts, *supra* note 11, art. 153(6).

17. ICNT, *supra* note 8, arts. 169(4), 173, Annex II, para. 7, Annex III, para. 10; Alternative Texts, *supra* note 11, paras. 140, 150, 172, Annex II, para. 7, Annex III, para. 10. Annex II, para. 7 was renegotiated in the 1978 New York Session and that text provides a detailed framework for revenue sharing and specifies the amounts of the contributions. U.S. Dep't of State, Office of the Law of the Sea Negotiations, U.S. Delegation Report, Resumed Seventh Session of the Third United Nations Conference on the Law of the Sea, New York, Aug. 21-Sept. 15, 1978, at 12, 13 (1978) (copy on file at the Center for Oceans Law and Policy, Charlottesville, Virginia) [hereinafter cited as 1978 Report, Pt. 2].

18. ICNT, *supra* note 8, art. 184, Annex III, para. 11(e).

19. *Id.* Annex II, para. 4(j)(i); *see also Oceanography Miscellaneous—Pt. 2: Hearings on the Law of the Sea Conference Briefings Before the Subcomm. on Oceanography of the House Comm. on Merchant Marine and Fisheries*, 95th Cong., 1st & 2d Sess. 88 (1977-1978) [hereinafter cited as *1977-78 Hearings*] (answers to questions of Mr. Breaux by Elliot L. Richardson).

20. ICNT, *supra* note 8, art. 150(1)(*g*)(C); Alternative Texts, *supra* note 11, art. 150*bis*(3).

ests of the developed States.[21] The international deep seabed is an area of common space and common use, as are the waters of the high seas, international airspace, air waves, outerspace, and Antarctica. Each of these common areas is vital. The position of the developed countries on the access issue is based on theories of international equity and political expediency, while the posture of the developing States is grounded on the concept of a fundamental redistribution of global wealth.[22] The theory that prevails in the debate over access to the deep seabed will greatly influence the resolution of the issue of access to other global common areas. This is a reality which is dictated by the aspirations and ideology of the Third World and by the willingness of the developed world to entertain and encourage them. The economic, political, and strategic implications for the developed world of the precedential effects of system of deep seabed access on other common areas are, therefore, profound. The very existence of an international seabed mining Enterprise would serve as the model for the future development of other common resources,[23] significantly affecting State and private mining operations. If the Enterprise also enjoyed a privileged competitive position, as the present Conference texts indicate, the implications would be quite serious.

The general theories applicable to the treatment of common areas also are relevant to matters with a more direct and pervasive effect on the distribution of global wealth. International commodity arrangements (ICA's)[24] and international financial development and monetary agreements would be affected by the institutional character of the deep seabed regime.[25] As pointed out, the system of governance of the Authority would establish the relative influence of member States in decisionmaking concerning the acquisition and distribution of deep seabed wealth. The Common Fund negotiations, future ICA's, and the structures of the World Bank and the International Monetary Fund necessarily would be affected[26] if, as the Third World demands and the Conference negotiating texts indicate, the system of governance were controlled by a numerical majority of States, and not by a device reflective of the realities of

21. *See 1977-78 Hearings, supra* note 19, at 109, 124, 131-50.
22. *Id.* at 71, 72, 109, 132.
23. *Id.* at 134.
24. ICA's are multilateral treaties affecting quantities and prices of commodities moving in international trade. *See generally* A. LAW, INTERNATIONAL COMMODITY AGREEMENTS (1975).
25. *1977-78 Hearings, supra* note 19, at 132.
26. *Id.*

global producer-consumer, importer-exporter relationships. The developing countries increasingly are pressing for decisive control of international agreements in the name of the New International Economic Order.[27]

Institutional precedents in the ocean mining regime therefore could severely prejudice the ability of the United States to protect its interests as a major producer, consumer, importer, exporter, and participant in financial development, monetary, and resource agreements. Free market principles adhered to by the United States would suffer if global financial development, monetary, and resource arrangments turned toward Third World control and toward international enterprises, which might enjoy advantages over State and private operations.

Additionally, the proposed economic provisions for the deep seabed regime reflect the demands of the Third World which are based upon their conception of the New International Economic Order and establish models for future international agreements.[28] Each provision departs, sometimes radically, from established U.S. policy.[29] Thus, for example precedents in the deep seabed mining regime could affect the ability of U.S. citizens to export their technology to developing countries on freely negotiated commercial terms and conditions, and could set the stage for direct export controls on U.S. commodities. It is difficult, if not impossible, to reconcile the creation of such precedents with fundamental U.S. political, economic, and strategic interests and free market principles. It is doubtful that the Senate would agree to a treaty which would have such consequences.

II. ANALYSIS OF THE DEEP SEABED REGIME

A. *Transfer of Technology*

Technology transfer has been a subject of intense negotiation at the Law of the Sea Conference. In 1976 Secretary of State Kissinger conceded in principle the transfer of technology to the Enterprise in exchange for a system of assured access to deep seabed resources.[30]

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27. *Id.* Additionally, the Third World has been pressing for increased control over global radio frequency allocation and international dissemination of news. Walsh, *Encounters with the Third World Seen in Allocating Frequencies*, 201 SCIENCE 513 (1978).

28. *1977-78 Hearings*, *supra* note 19, at 134.

29. *Id.* at 112-14.

30. Remarks by Secretary of State Henry A. Kissinger after meeting Ambassador Hamilton Shirley Amerasinghe, President of the Fifth Session of the Third U.N. Conference on the Law of the Sea, at the United Nations, New York, New York (Sept. 1, 1976).

Secretary Kissinger did not describe the conditions under which this transfer would take place, allowing the Third World countries to seize the initiative in implementing his concession.

The South demands the transfer of technology to the Enterprise and developing countries as a mandatory condition to State and private access to deep seabed minerals. The Third World believes that such mandatory technology transfer is essential to the participation of developing countries in ocean mining and to a functioning Enterprise.[31] In addition, mandatory technology transfer in the deep seabed regime represents an important element in the Third World's broader program for overall economic development.[32]

The North maintains that seabed mining technology would be available to the Enterprise and developing countries through normal operation of the international market place.[33] Nevertheless, the United States delegation, while believing that the Third World apprehensions are genuine although baseless, has, subject to Cabinet level review, conceded mandatory transfer "on fair and reasonable commercial terms and conditions" to the Enterprise, but not to developing countries.[34] Spokesmen for the delegation minimize the adverse commercial consequences, the detrimental effect on technology development, and the negative precedential nature of mandatory transfer. They argue that (1) the mandatory transactions can be commercially fair and reasonable; (2) technological innovation can be protected; and (3) the deep seabed regime represents a unique situation lacking significant precedential effects.[35]

The South's fear that seabed mining technology might not be available to the Enterprise or to developing countries under normal market conditions is unfounded. States that are parties to the treaty would provide the funding to the Authority for the purchase of seabed mining technology. Furthermore, because State and private

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31. U.S. Dep't of State, Office of the Law of the Sea Negotiations, U.S. Delegation Report, Seventh Session of the Third United Nations Conference on the Law of the Sea, Geneva, Mar. 20-May 19, 1978, at 12 (1978) (copy on file at the Center for Oceans Law and Policy, Charlottesville, Virginia) [hereinafter cited as 1978 Report, Pt. 1].

32. *See* United Nations Conference on Trade and Development, Report of the Intergovernmental Group of Experts on an International Code of Conduct on Transfer of Technology on its Fifth Session, Annex I, U.N. Doc. TD/AC.1/15 (1978) [hereinafter cited as Code].

33. *1977-78 Hearings, supra* note 19, at 60, 126.

34. *Id.* at 57, 60-62, 125.

35. *Id.* at 61, 88, 89, 124; *see also Law of the Sea: Hearings on Review of the Seventh Session of the United Nations Law of the Sea Conference Before the Subcomm. on Arms Control, Oceans and International Environment of the Senate Comm. on Foreign Relations*, 95th Cong., 2d Sess. 70 (1978) [hereinafter cited as *1978 Hearings*] (State Department answers to additional questions submitted by Senator Percy).

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enterprises seeking licenses would provide the Authority with its choice, for the Enterprise or for developing countries, between two equally attractive mine sites and because most ocean mining technology is site-specific, mining companies would sell their techology to the Authority or developing countries to maximize profit.[36]

One cannot accept, therefore, the Third World view that mandatory transfer is a practical necessity. One must accept, however, the reality that a forced sale rarely is based on commercial terms and conditions; free negotiation is essential. The U.S. delegation's argument that mandatory transfer can be on fair and reasonable commercial terms and conditions is, therefore, contradictory.

The delegation's contention that technological innovation can be protected is clearly erroneous. The adverse commercial consequences inherent in mandatory transfer would necessarily discourage technological development. Implementation of mandatory transfer, therefore, would undermine a major U.S. interest in promoting and protecting technological development.[37]

Finally, mandatory transfer of technology would have significant precedential effects. The deep seabed regime will be a unique situation only if both the North and the South accept it as such. The Third World, however, asserts that mandatory transfer of deep seabed technology is only one aspect of the developing countries' right to advanced technology. In the negotiations to conclude an international Code of Conduct on Transfer of Technology, the Group of 77[38] asserts that "technology is a part of universal human heritage and that all countries have the right to access to technology, in order to improve the standard of living of their peoples . . . ."[39] The Group of 77 regards technology transfer as an "effective instrument for the establishment of a New International Economic Order."[40] They maintain that "an international legally binding instrument is the only form capable of effectively regulating the transfer of technology."[41] The U.S. delegation to the Code of Conduct negotiations rejects these Third World positions, recogniz-

36. *See* ICNT, *supra* note 8, Annex III, para. 5(*j*); HOUSE REPORT, *supra* note 3, at 20.

37. *1977-78 Hearings*, *supra* note 19, at 113, 134.

38. The "Group of 77" is a coalition of over 100 developing countries which have banded together to pursue their common interests within the U.N. system. Adede, *The System for Exploitation of the "Common Heritage of Mankind" at the Caracas Conference*, 69 AM. J. INT'L L. 31, 37 n.13 (1975); *see also* Nyhart, *The Interplay of Law and Technology in Deep Seabed Mining Issues*, 15 VA. J. INT'L L. 827, 833-36 (1975).

39. Code, *supra* note 32, preamble, art. 2.

40. *Id.* preamble, art. 4.

41. *Id.* preamble, art. 13.

ing that capitulation to the Group of 77 would have negative effects on both the international sale and the domestic development of technology.

The problem of technology transfer is aggravated by Third World resistance to effective protection of proprietary rights. This resistance exists both at the Conference and in the Code of Conduct negotiations.[42] Justifying mandatory transfer of seabed mining technology on the theory that the seabed regime is unique not only ignores reality, but also erodes the general U.S. policy on technology transfer by creating an exception which conforms with the position of the Group of 77. Clearly the seabed regime is not unique insofar as the transfer of technology is concerned. The Third World demand at the Law of the Sea Conference is directed toward a wider goal and a concession by the North in those negotiations is a precedent for future arrangements concerning the developing countries' rights to advanced technology. Acceptance of the Third World position could be exceedingly costly for the United States,[43] a nation which relies on the development and sale of technology for a substantial portion of its foreign earnings and its gross national product. Also, the degree of centralization and artificial control in the Authority as presently structured in the negotiating texts would seriously damage the U.S. interest in promoting free market principles.[44] Finally, in terms of the kind of global interrelationships the United States should seek to foster, the acceptance of the concept of developing countries' rights to technology without corresponding developing countries' duties to protect proprietary information would be counterproductive. The model for international relations should be cooperation, but on the basis of acceptance of mutual rights and duties among developed and developing countries.

Considering all these factors, mandatory transfer of technology would be a serious deterrent to U.S. Senate approval of the treaty. Whether the provision by itself would be a sufficient condition for disapproval is unclear; however, in combination with other problems, mandatory transfer probably would be enough to tilt the scales against the treaty.

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42. Code, *supra* note 32, at 7 nn.f & g; *see also 1977-78 Hearings*, *supra* note 19, at 113.

43. The development and sale of seabed mining technology alone accounts for many millions of dollars. *See* J. Nyhart, Cost Model of Deep Ocean Mining and Associated Regulatory Issues (Massachusetts Institute of Technology Sea Grant Report 78-4, Mar. 1978).

44. *1977-78 Hearings*, *supra* note 19, at 134.

B. *Production Ceiling*

Land-based producers of the minerals that will be exploited in the deep seabed insist that ocean mining production must be limited. These producer-States fear that absent a seabed production limit, ocean mining will adversely affect their economies. The ceiling issue cuts across North-South alignments: the North is divided on the issue while the South remains united.[45] Canada, a major nickel producer, is a proponent of production controls. Its insistence on seabed production limitations overshadows even the efforts of developing country cobalt, nickel, and copper producers, with the support of the full Group of 77, to achieve the same end.

Until recently the United States has strongly opposed seabed mining production controls, both in principle and in fact. The United States has preferred adjustment assistance and compensation for substantial loss of earnings by land-based producers resulting from deep seabed production.[46] Nevertheless, in 1976, the United States conceded the principle of seabed production controls.[47] As a practical matter, however, those controls were to be designed to have minimal impact on foreseeable seabed production: they would be linked to growth in the nickel market, yet a six percent minimum growth would be imputed.[48] The United States justified the concession as a measure calculated to respond primarily to developing, but not developed, land-based minerals producers.

In 1978, however, the U.S. delegation responded to pressure from Canada for a production ceiling that might limit deep seabed production. Subject to Cabinet-level approval, the delegation accepted a ceiling linked to the actual growth of the world nickel market.[49]

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45. 1978 Report Pt. 1, *supra* note 31, at 13-14; *1977-78 Hearings*, *supra* note 19, at 145; U.S. Dep't of State, Office of the Law of the Sea Negotiations, U.S. Delegation Report, Sixth Session of the Third United Nations Conference on the Law of the Sea, at 9-10 (1978) (copy on file at the Center for Oceans Law and Policy, Charlottesville, Virginia) [hereinafter cited as 1977 Report].

46. *See* U.S. Proposed Amendments to the Committee I Single Negotiating Text, art. 9 (as amended), Dec. 1975.

47. *1977-78 Hearings*, *supra* note 19, at 145.

48. *Id.* at 103, 145. In addition, seabed mining would have been entitled to 100% of the growth segment.

49. Past growth would be projected to fix the ceiling. *Id.* at 56-57, 116; *see also* Statement Made in NG-1 by the Representative of the United States [hereinafter cited as NG-1 Statement], *reprinted in* 2 STIFTUNG WISSENSCHAFT UND POLITIK, FORSCHUNGSINSTITUT FÜR INTERNATIONALE POLITIK UND SICHERHEIT, DOKUMENTE DER DRITTEN SEERECHTSKONFERENZ DER VEREINTEN NATIONEN - NEW YORKER SESSION 1978, at 235, 237 (1978) [hereinafter cited as SWP - NEW YORKER SESSION]. Ninety-one percent of the growth segment would be available to ocean mining at the outset, to decline to sixty-five percent by the end of the interim period.

In theory, such a link would provide real protection to both developed and developing producers of the minerals contained in manganese nodules.

Nonetheless, the production ceiling has three serious flaws from the U.S. standpoint: (1) to the extent that the ceiling may limit licensing of seabed mining operators, it is incompatible with meaningful assured access; (2) the ceiling is contrary to established U.S. economic policy concerning international restrictions on commodity production; and (3) the ceiling sets a negative precedent for future ICA's and for development of other international resources.[50]

First, the production ceiling threatens meaningful assured access because the growth of the world nickel market may fall to the point where seabed mining would be severely curtailed or halted.[51] Such a decline in the nickel market might reflect low demand for and high availability of nickel, but might not have any relevance to the availability of cobalt and manganese. These latter two minerals could be subject to interruptions of supply for political or other reasons. For example, the ceiling might prevent the United States from acquiring the manganese essential for domestic steel production. Also, another crisis in Zaire could adversely affect supplies of cobalt, a key material in the production of high technology items. Therefore, the ceiling cannot be reconciled with assured access which seeks to guarantee that interruptions of terrestrial supplies do not have a detrimental impact on the national economy and security.

Furthermore the production ceiling, which limits the number of mine sites, would lead to applicant selection based on the policies of the Authority. These policies include: stimulating developing country participation in mining; promoting Enterprise participation in mining; assuring equitable distribution of authorizations to mine; and protecting land-based producers.[52] These policies would cause applicants to propose joint ventures with developing countries or the Enterprise and the location of processing plants in less-developed countries. This would prevent the United States from capturing the direct benefits of the mining, even though U.S. companies might be involved.

The production ceiling is the functional equivalent of internationally imposed direct export controls.[53] The United States has never

50. *1977-78 Hearings, supra* note 19, at 112.
51. *Id.* at 95.
52. ICNT, *supra* note 8, art. 150; Alternative Texts, *supra* note 8, art. 150.
53. *See 1977-78 Hearings, supra* note 19, at 112-13.

accepted such controls on its own production, although this country has joined in various commodity arrangements calculated to stabilize the supply and demand situation in the international market place.[54] The economic reasons for this policy are unassailable. By restricting supplies, production controls tend to distort markets, artificially raise prices, and result in short-term gains to producers to the disadvantage of consumers. The entry of new and potentially more efficient producers is thwarted, while inefficient producers are encouraged. The end result is a misallocation of resources. Additionally, diversification of supply is restricted or prevented and may cause vulnerability to politically motivated restraints on supplies or collusive agreements on pricing.[55] This would be especially detrimental for consumer States, many of which are developing countries, and therefore, extremely vulnerable. Moreover, in the long run, producer countries, a relatively small group of developed States, may not benefit.

Departing from the traditional U.S. stance on this issue in the Law of the Sea negotiations can have serious long-range effects on numerous areas of international agreement on commodities. As the largest consumer of raw materials, the United States has a great deal to lose from international production controls.

To argue, as do the proponents of the seabed production ceiling, that the deep seabed regime is unique ignores the fact that this perception is not shared by other countries[56] and disregards the adverse effects of the ceiling on access to ocean minerals.[57] This argument stands little chance of acceptance in the U.S. Senate.

The fact that the ceiling is limited in duration does not cure these flaws. There is little reason to believe that the United States could resist the inevitable foreign political pressure for renewal of the ceiling or for its replacement by one or more ICA's. A treaty contain-

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54. The United States is a party to the ICA's for tin and coffee. The tin agreement imposes export controls on net exporters of that commodity and establishes a buffer stock. Because the United States is not a net exporter, U.S. production is unaffected by the controls. The coffee agreement also establishes export controls on net exporters, which do not affect the United States because it is a net exporter.

The United States is not a party to the cocoa agreement, refusing to join because the quota for exports was too restrictive and the established price too high.

A sugar agreement has been negotiated, but is not in force. Here again, direct export controls are to apply to net exporters, including the United States. Both wheat and copper ICA's are under negotiation. They possibly would limit net exporters, but would not affect U.S. production.

55. *1977-78 Hearings*, *supra* note 19, at 112.

56. *See* text at notes 38-43 *supra*.

57. *1977-78 Hearings*, *supra* note 19, at 113.

ing the production ceiling therefore would be approved only in spite of that ceiling.

C. *Authority Participation in Commodity Arrangements*

The Third World has insisted that the Authority participate in future international commodity arrangements and represent all seabed production, not merely that of the Enterprise.[58] The original U.S. response was to deny the Authority any participation in ICA's. The Group of 77 remained adamant in their demand, however, and the United States agreed to Authority participation on behalf of the Enterprise. More recently, the United States conceded that the Authority might act on behalf of all deep seabed mineral production, if the ICA participants, including all major producers and consumers, also agreed.[59]

The Third World position remains firm. If that position prevails, countries such as the United States which would produce nickel, cobalt, and manganese almost solely by virtue of ocean mining operations, would be deprived of the right to represent their production interest. The position in the Authority of the land-based producers undoubtedly would be strengthened by the support of the Group of 77. Given this fact, seabed producers would certainly fare poorly in comparison to terrestrial producers under such a system. Even if the Authority represented only the production of the Enterprise, the land-based producers, by virtue of their power in the Authority and by taking into account their land-based production, would have a dominant position over seabed producers.[60]

Having accepted a seabed production ceiling in the Law of the Sea treaty, the United States would find it difficult to resist similar controls in ICA's in which the Authority represented seabed production in whole or in part. For example, for an ICA involving copper, of which the United States is both the largest producer and the largest consumer, Authority participation for seabed production could have the effect of imposing direct export controls on U.S. land-based production.[61]

While the United States would not be legally compelled to join ICA's in which the Authority might participate, practically, the

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58. ICNT, *supra* note 8, art. 150(1)(*g*)(A) reflects the developing countries' position.

59. 1978 Report, Pt. 1, *supra* note 31, at 13.

60. Cobalt is the possible exception. For a detailed discussion, *see* NODULES, *supra* note 2, at 41-56.

61. *Id.* at 50-51.

United States might not be able to remain outside of such agreements. Furthermore, the positions taken by land-based producer-States and the Group of 77 suggest that the United States could not block Authority participation in critical ICA's.[62]

The very notion of an international organization representing the production of States is difficult to accept. A central principle of U.S. international commodities policy is that decisionmaking power in an ICA should be weighted to reflect the relative economic interests of every participant, whether producer or consumer.[63] Authority participation on behalf of all seabed production would clearly and directly defeat this principle. Authority representation of only Enterprise production would subvert this U.S. principle, given that the Authority probably would be dominated by the small group of land-based producers with the Group of 77 support.

Whatever the system, access to deep ocean minerals will be adversely affected if seabed production is limited. Additionally, acceptance of these seabed arrangements could influence the future allocation of the resources of other global common areas in a similar manner, negatively affecting U.S. interests. The U.S. Senate surely would take a dim view of these possible consequences.

D. *Quota System*

The system of national quotas for mine sites is another issue which divides the North but not the South. From its inception, the system has been primarily a French and Soviet imperative.[64] France is concerned that, without a limit on the number of mine sites that a State could hold, the United States would assume an overwhelmingly competitive position in ocean mineral development.[65] The Soviets also fear U.S. dominance in deep seabed mining. As a major land-based producer of nickel, copper, cobalt, and manganese, and lacking ocean mining technology, the Soviet Union is not worried about exclusion from seabed mining as a result of U.S. dominance. Rather, the U.S.S.R. is concerned that the United States with a potential string of mine sites running from the Clarion-Clipperton Fracture off Mexico to the deep ocean plains off the Soviet Union's

62. *See* ICNT, *supra* note 8, para. 150(1)(*g*)(A), reflecting the Group of 77 position. There is no express provision for a State to block Authority participation; however, there is an ambiguous provision which arguably may imply such a power.

63. *1977-78 Hearings*, *supra* note 19, at 112.

64. *Id.* at 80, 89, 95.

65. *Id.*

Pacific continental shelf, would become independent of foreign manganese, nickel, and cobalt supplies, and therefore, would gain a strategic advantage by virtue of extensive high seas activities subject to U.S. military protection, across the breadth of the Pacific.

The United Kingdom and Japan also favor limitations on the number of mine sites. These States fear that their operators would be unable to compete for the best mine sites against a U.S. mining industry unfettered by a national site limitation. The United Kingdom and Japan envision a limitation in the form of an antimonopoly provision giving site allocation preference to States that have no existing mining operations. One formula, for example, gives preferential status over States which have three or more operations to a State without any mine sites.

An antidensity provision also has been informally discussed among some countries. This would limit the number of mine sites which a single State would be permitted to have in a particular geographic area.

The Third World does not believe that such limitations are crucial to their economic interests. Nonetheless the quota and antimonopoly systems have been endorsed in principle by the Group of 77 as conceptual deterrents to hegemony over important ocean resources.[66]

In the past, the United States firmly opposed any quota or antimonopoly system.[67] Recently, however, U.S. negotiators have shown some willingness to reconsider this traditional stand.[68] A quota, an-

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66. *See* ICNT, *supra* note 8, Annex II, para. 5(1), which reflects the Third World position.

67. 1978 Report, Pt. 2, *supra* note 17, at 8, illustrates the position long held by the United States that "it could not accept any provision which would deny a contract to an American citizen on the basis of his nationality."

68. In hearings before the House Subcommittee on Oceanography, the following exchange took place:

> Mr. Santini: . . . does the United States . . . oppose any form of national quota for ocean mining contracts? Ambassador Richardson: An accurate answer to that is that we have discussed with a very small number of countries the question of a possible application of a quota. We have not come close to agreement on such question, but it is a matter on which some countries are strongly insistent. It is hard at this stage to foresee exactly what the result might be. Mr. Santini: And if I may summarize your answer, the United States does not have any position with regard to a quota?
>
> Ambassador Richardson: Our basic positon is that we are opposed to a quota.

1977-78 Hearings, *supra* note 19, at 80.

Most recently, the following answers to written questions were provided for the record by Ambassador Richardson:

> The U.S. has made no statement in any official forum of the Conference which

timonopoly, or antidensity system is contrary to U.S. interests, particularly within the context of a seabeds regime establishing production controls, Authority participation in ICA's, and a mine site banking system for the benefit of the Enterprise and developing countries. Any such system threatens U.S. access, is inherently anticompetitive, and is certain to lead to misallocation of resources because inefficient producers are guaranteed entry at the expense of efficient producers.

Assured access would be meaningless if limited to fewer mine sites than would be commercially attractive to U.S. investment interests and to fewer sites than would be necessary to provide the United States with substantial independence from foreign supply sources of manganese, cobalt, and nickel. Given the finite number of first generation mine sites, the large long-term mineral requirements of the United States, and the current expectation of continued U.S. leadership in ocean mining technology, almost any quota system would limit U.S. access.[69] When considered in conjunction with the banking system and the negative effects of the production ceiling, the limitation could become serious enough to discourage participation by U.S. companies. ICA's involving the Authority would further aggravate the situation. Antimonopoly or antidensity provisions would have similar, though conceivably less serious, consequences than a quota system. The impact of any limited access system on foreign State-owned or subsidized companies would be less serious to the extent that return on investment would be less critical and perhaps more easily achieved.

The mathematics of the situation clearly demonstrate the impact of such systems on U.S. interests. For example, the currently contemplated production ceiling would allow approximately twenty-six seabed mine sites by the year 2000, assuming a 4.5% growth rate in the world nickel market.[70] If the assumption is erroneous, the number of available sites could be fewer. The banking system would

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would indicate it accepts a quota/anti-monopoly provision in principle. We have indicated privately when asked that no provision that would result in discrimination against American firms could be seriously considered . . . . We believe that this is an issue on which we have very little flexibility.

Id. at 89.

69. Estimates of the number of prime mine sites vary from less than 100 to over 300. *See, e.g.*, 1978 Report, Pt. II, *supra* note 17, at 7. The relevant mineral requirements of the United States will be substantial and will continue to grow in the foreseeable future. NODULES, *supra* note 2, at 42.

70. *1977-78 Hearings*, *supra* note 20, at 57, 90. The forecast of a 4.5% growth rate could be optimistic. *Id.* at 95.

reduce the number of mine sites available to State and private enterprises to a maximum of thirteen, because it would assure the Enterprise or joint ventures with developing countries one-half of the available sites. The Enterprise could compete successfully against State and private enterprises for some or all of the sites that are not banked.[71] If an ICA prevailed instead of the ceiling, then the number of sites available to State and private enterprises could decline further.

Thus, the number of sites to be allocated to any single State under a quota or similar arrangement would be very small: a State could not expect to have more than one or two mining operations.[72] In the absence of such a system, U.S. enterprises could operate approximately one dozen sites by the year 2000. If forced to operate under a quota or similar system, U.S. companies might decide to abandon the field because it is insufficiently profitable.[73] Ocean mining is a high-risk, expensive venture, and a single mine site might not provide an adequate return on the investment in mining ships, ore carriers, and processing facilities.[74] Even if U.S. enterprises did develop one or two sites, the output would not reduce substantially the national dependence on foreign supply sources.[75] In the final analysis, assured access would be nonexistent or simply meaningless.

A quota system could serve as a model for future development of other common resources. All of the negative economic consequences would pertain to virtually any resource to which such a system were applied. In addition, the potential for U.S. independence from foreign sources of a number of important commodities could decline or disappear. With such impacts, any of these sorts of provisions in the seabed regime probably would have profound adverse effects on the prospects for U.S. Senate approval of a Law of the Sea Treaty.

E. *Review Conference*

In 1976 Secretary of State Kissinger agreed to consider treaty

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71. *Id.* at 90.

72. *Id.* at 95.

73. Furthermore, if a quota only allows a few sites to be authorized, many potential investors may be be deterred because the chances of obtaining authorization to mine are too slim. The estimate of 12 U.S. sites in the absence of a quota is conservative. The industry has suggested that 20 sites could be anticipated. Kennecott Copper Corporation, Sunken Treasure, the promise of ocean mining—the perils of delay (Sept. 1977) (unpublished).

74. *1978 Hearings, supra* note 35, at 37, 38.

75. *See* U.S. DEP'T OF COMMERCE, NICKEL, COBALT, COPPER, AND MANGANESE: FUTURE SUPPLIES AND DEMAND AND IMPLICATIONS FOR SEABED MINING, tables 3-7 & 3-9 (unpublished).

review conferences at twenty to twenty-five year intervals.[76] He intended this concession to make the dual access system more palatable to the Third World on the theory that if the seabed regime worked poorly the review conference could improve it. As in the case of U.S. concessions on technology transfer, however, Secretary Kissinger did not describe precisely what he was conceding. Consequently, the South quickly detailed its view of a meaningful review mechanism.

The negotiating texts reflect the Group of 77 formula for the review conference, providing that twenty years after the treaty becomes effective, a review conference would seek to renegotiate the seabed mining regime.[77] According to one negotiating text, if the Conference fails to amend the treaty or otherwise to reach agreement after five years, the system automatically would exclude further direct access by State and private enterprises.[78] Another text would allow the Assembly to decide whether to impose a moratorium on further access by State and private companies or by the Enterprise.[79] Under this approach, the one-nation, one-vote Assembly naturally would impose a moratorium on direct access by State and private mining operations in order to achieve maximum negotiating leverage over the developed countries.

The U.S. delegation opposes any moratorium mechanism in the review conference.[80] If the developing countries were concerned enough to negotiate for five years to amend the treaty, it would be either because the Enterprise had not worked satisfactorily vis-à-vis the State and private operators, or because the Enterprise could be substantially strengthened by amending the treaty. Even if the moratorium applied to further access by the Enterprise, this would be a small price for the developing countries to pay to deny further access by the developed countries and thereby obtain a decisive bargaining position in the review conference.[81]

A moratorium on State and private access twenty-five years after

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76. Remarks of Secretary of State Henry A. Kissinger at a reception at the United States Mission for the Heads of Delegations attending the Fifth Session of the Third U.N. Conference on the Law of the Sea, New York, New York, Sept. 1, 1976.

77. ICNT, *supra* note 8, art. 153; Alternative Texts, *supra* note 11, art. 153.

78. ICNT, *supra* note 8, art. 153(6).

79. Alternative Texts, *supra* note 11, art. 153(6).

80. "The U.S. voiced strong reservations on this provision and noted that it could not agree to the possible termination of its right of access to seabed minerals just at the time the need for them may become acute." 1978 Report, Pt. 1, *supra* note 31, at 15.

81. This may not always have been perceived by the U.S. delegation. *1977-78 Hearings*, *supra* note 19, at 78, 90.

the treaty entered into force would deny the United States and other industrialized countries a supply of manganese, which could simply be unavailable from any other source.[82] The moratorium also could expose the United States and the rest of the developed world to radical increases in the prices of cobalt and nickel because land-based suppliers would be unable to meet global demand. The risk of politically motivated interruptions of foreign supplies would be considerable to the United States and other similarly situated countries. Thus, the United States and other developed countries would have little bargaining power in the review conference and their long-term interests would be seriously threatened.

As in other provisions of the seabed regime, the structure of the review conference would create an undesirable model for the treatment of other common resources. Therefore, it is impossible to believe that the U.S. Senate would regard a review conference with a moratorium as anything other than a threat to the economy and security of the United States. Senate acceptance of a treaty containing such a provision would be unlikely.

F. *Revenue Sharing*

All sides have accepted the principle of revenue sharing by State and private seabed mining operations for the benefit of developing countries.[83] More recently, revenue sharing participants have accepted the principle of funding the Enterprise.[84] Most aspects of the mechanism to implement revenue sharing, however, are disputed.

Developing countries find the notions of profit and the common heritage of mankind to be incompatible in principle.[85] The Group of 77 will tolerate profit in the seabed mining regime only to the extent that it is a necessary condition for ocean mining, at least

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82. *See* text at note 5 *supra*.

83. As early as 1970 the United States formally accepted revenue sharing. Draft United Nations Convention on the International Sea-Bed Area: working paper submitted by the United States of America, art. 5(2), U.N. Doc. A/AC.138/25 (1970), *reprinted in* 25 U.N. GAOR, Supp. (No.21) 130, 133, U.N. Doc. A/8021 (1970). "Equitable sharing of benefits" from deep ocean mining was a key element of the Declaration of Principles Governing the Seabed and the Ocean Floor, and the Subsoil thereof, Beyond the Limits of National Jurisdiction, G.A. Res. 2749, 25 U.N. GAOR, Supp. (No.28) 24, U.N. Doc. A/8028 (1971). That resolution provided the framework for the seabed mining regime.

84. In 1976 the United States agreed to provide financial contributions to the Enterprise. Remarks of Secretary of State Henry A. Kissinger after meeting Ambassador Hamilton Shirley Amerasinghe, President of the Fifth Session of the Third U.N. Conference on the Law of the Sea, at the United Nations, New York, New York (Sept. 1, 1976).

85. *See, e.g.*, 1 Official Records of the Third United Nations Conference on the Law of the Sea, U.N. Doc. 157 (1975) (statement by Mr. Bakula of Peru).

until the Enterprise can begin to operate independently of financial contributions from developed States. Thus, the Group of 77 approach to revenue sharing seeks to extract maximum contributions from ocean mining operations, while leaving to the miner only the minimum return essential to attract investment.[86]

The United States and other developed countries largely have acquiesced in the Third World's position, rather than attempt to establish revenue sharing on the basis of the reasonable administrative expenses of the Authority, the start-up funding requirements of the Enterprise, and the fair share to be provided to countries which contribute little or nothing to the development of the resource. The ocean mining industry's argument that it is not a public utility for which government legitimately can set rates has been ignored.

The Group of 77 has had to recognize that the wealth of the deep seabeds is far less than it was thought to be a few years ago.[87] The Group also has conceded that deep seabed mining is a very risky technical enterprise that is highly sensitive to the vagaries of the metals markets. But these realities are incompatible with large front-end entry payments and inflexible, long-term royalties sought by the developing countries. Modest entry fees related to reasonable administrative expenses, and profit sharing which is sensitive to technical problems and the fluctuations in the market are essential prerequisites for the participation of private operators.

The structure of the revenue sharing system in the recent negotiating text partially responds to these realities.[88] The levels of payments, however, still are a serious problem. They reflect a heavy reliance on a computer model which provides merely a base-case for a hypothetical mining operation.[89] If the assumptions of the model are overly optimistic, the levels of payments could be excessively high.[90] Such a system could render assured access by private operators meaningless, particularly for the United States because U.S. operators would not receive cushioning State subsidies.

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86. *See* 1978 Report, Pt. 1, *supra* note 31, at 16-19; 1978 Report, Pt. 2, *supra* note 17, at 9-14.

87. The records of the early debates in the U.N. General Assembly reveal that the wealth to be derived from development of the deep seabed was widely regarded as practically limitless. It is now clear that the returns from ocean mining will be very modest at best. *See* J. Nyhardt, *supra* note 43.

88. 1978 Report, Pt. 2, *supra* note 17, at 13-14.

89. *Id.* at 13.

90. This is a function of the philosophy that payments to the Authority will be the maximum possible for the benefit of developing countries, with returns to the operators being the minimum necessary for investment purposes.

From the standpoint of precedential impact, revenue sharing, however structured, would constitute a model for other international arrangements relating to development of common resources. Antarctica already has been identified by some countries as an area in which resource development should provide revenues to the developing countries.[91] Considered as a use tax, it would be natural to apply revenue sharing in outer space for communications, energy development and transmission, or other purposes. A revenue sharing plan premised on minimum return would put at serious risk the development and use of common resources by private enterprises. Again, the U.S. Senate may find this treaty provision to be incompatible with important national interests.

G. *Non-Manganese Nodule Minerals*

Negotiating texts reflecting the Group of 77 position provide that minerals not contained in manganese nodules shall not be developed until a regime is established for mining them.[92] The effect of these texts is to impose a moratorium on such development until a regime is designed to the satisfaction of the Group of 77.

The U.S. delegation has accepted, as "a significant improvement," a text which provides that the non-nodule regime will be established by amendment to the treaty rather than by the establishment of regulations by the Authority.[93] If anything, the favored approach places non-nodule development farther into the future. Amendment of the treaty would take longer than the promulgation of regulations. The U.S. delegation position loses sight of the fact that, either way, there is an indefinite moratorium on the development of minerals not found in manganese nodules.

Because metaliferous sediments of the deep ocean may prove extremely valuable, the delegation's position is hard to justify. The position certainly is inconsistent with assured access, and once again, may create an unfavorable precedent of prohibiting development of common resources until permitted by the Third World.

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91. This line of argument has surfaced largely in corridor conversations at the United Nations. Nonetheless, and perhaps for that very reason, the linkage between the deep seabed regime and the future international treatment of Antarctic resources should be regarded as a difficulty demanding serious reflection.

92. ICNT *supra* note 8, art. 150(1)(*g*)(C); Alternative Texts, *supra* note 11, art. 150*bis*(3).

93. 1978 Report, Pt. 1, *supra* note 31, at 5.

H. *The System of Governance*

The system of governance for the deep seabed regime is the most important single issue remaining at the Law of the Sea Conference. The control of the deep seabed minerals and the course of future international institutional development will depend on the resolution of this issue, which reveals the fundamental clash of material and ideological interests of the North and South.

The developing countries insist that they must control the mineral resources of the deep seabed and that they must direct the actions of global institutions. In the Third World's view, a fundamental redistribution of wealth requires a restructuring of the global system of public order to establish a lawmaking democracy of nations. Control of the vitally important mineral resources of the deep seabeds is an important step toward the realization of this New International Economic Order.[94]

The developed countries can accept a redistribution of wealth, but not at the expense of their own material prosperity and political security.[95] The North is apprehensive of a lawmaking international democracy which would base its economic program on a transfer of the wealth and independence of the minority. The developed countries fear a deep seabed mining regime which will interpose the will of the Third World between the industrialized nations and the raw materials necessary to fuel their economies and protect their security.

The Law of the Sea Conference negotiating texts provide for a bicameral system of decisionmaking in the Authority: an Assembly, comprised of all States that are parties to the treaty;[96] and a chambered Council, comprised of thirty-six States representing various political and economic interests and reflecting "equitable geographical distribution."[97] The critical issues arise in the voting and composition of the Assembly and Council and in their relative powers

94. *1977-78 Hearings*, *supra* note 19, at 132; 1 Official Records of the Third United Nations Conference on the Law of the Sea 70, 73, 76, 82-84, 94-96, 157, 167 (1975).

95. Redistribution means something very different for the developed countries. Helen B. Junz, Deputy Assistant Secretary of the Treasury for Commodities and Natural Resources has stated: "Our policy is to separate and reject the category of measures designated to effect income transfers through commodity arrangements and to look positively, but discriminatingly, at proposals aimed at greater price stability. We believe that income transfers should be effected through development aid." Statement by Helen B. Junz before the Subcomm. on Foreign Economic Policy of the Senate Comm. on Foreign Relations, Feb. 27, 1978, at 11 (mimeo).

96. ICNT, *supra* note 8, art. 157.

97. *Id.* art. 159.

and functions. In each organ, decisions on issues of substance would be effected by majority vote: two-thirds in the Assembly and three-fourths in the Council.[98] The Council would have a chamber for each of the following categories of countries: those that have made the greatest contribution to deep seabed development as demonstrated by substantial investments or advanced technology (four members); those that are major importers of the kinds of minerals developed from the deep seabed (four members); those that are major exporters of deep seabed minerals (four members); those developing States representing special interests, including large populations, landlocked or geographically disadvantaged countries, major importers of the relevant kinds of minerals, and least developed countries (six members); and those countries that represent international regions, including Africa, Asia, Eastern Europe, Latin America, and Western Europe (eighteen members).[99] The chambers for greatest contributors to seabed development, major importers, and international regions each would have at least one Eastern European member.[100]

The Assembly would be the "supreme organ" of the Authority, setting general policies, while the Council would be the "executive organ," establishing "specific policies" in conformity with the provisions of the treaty and the policies of the Assembly.[101] The Assembly would give final approval to rules and regulations provisionally adopted by the Council.[102] Authorizations to operate would be approved by the Council in conformity with such rules and regulations.[103]

Two facts are evident from the composition and the voting and relative powers and functions of the Authority: (1) the plenary, one-nation, one-vote Assembly would be the clearly dominant force in the decisionmaking process; and (2) in the Council, the chambers would be weighted in favor of the developing countries, with a strong role played by the socialist bloc. The United States and other nonsocialist countries would be substantially outnumbered and outvoted. The United States and its allies could prevent neither the approval of possibly unqualified Third World and socialist applications, nor disapproval by Third World and socialist countries of nonsocialist developed country applications. Rules and regulations also could be

98. *Id.* arts. 157(6), 159(7).
99. *Id.* art. 159(1).
100. *Id.*
101. *Id.* arts. 160(1), 159(1).
102. *Id.* arts. 158(7)(XVI), 160(2)(XIV).
103. *Id.* art. 160(2)(X).

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adopted without regard to the legitimate interests of the United States and other nonsocialist developed nations.

The negotiating texts so thoroughly circumscribe dispute settlement procedures and give such an advantage to the Third World, that there would be little effective judicial remedy for abuses by the Council or the Assembly.[104] Therefore the system of governance threatens not only the U.S. interest in obtaining deep ocean minerals, but also the U.S. interest in promoting a fundamentally fair international institutional environment.

Third World insistence on a one-nation, one-vote decisionmaking process fails to recognize the remarkable anomalies that result from such a system. Testimony before the House Subcommittee on Oceanography has provided some insight into the consequences of implementing the Third World view. It has been pointed out that a one-nation, one-vote system would result in the following:

1. Five large countries (the People's Republic of China, the United States, the U.S.S.R., India, and Indonesia) with two billion people—one-half the world's population—would have five votes, while the other countries—the other one-half of the world's population—would have about 145 votes;
2. The votes of those same five countries would be offset by the votes of five small countries (Qatar, San Marino, Saotome and Principe, Seychelles, and Tonga) comprising 350,000 people;
3. Africa, with ten percent of the global population, would have thirty-four percent of the votes; Asia, with about sixty percent of the world's people, would have fewer than half those votes; North America, which has nine percent of world population, would have two percent of the votes;
4. Twenty-five nations, each having populations the same size as a congressional district or smaller, would have twenty-five votes in the world forum, while the people represented by twenty-five votes in the U.S. House of Representatives, in a bicameral system which is subject to the checks and balances of an exec-

104. This is largely a function of the non-reviewability of the wide discretion allowed the Authority. *See id.* art. 191.

> utive branch, ultimately would have one vote in the contemplated international system.[105]

The conclusion is obvious: a system that superficially appears democratic is really, in all important respects, very undemocratic. From the standpoint of U.S. interests and from that of the international community, this is not a system which should be encouraged. There is absolutely no doubt that this system, if adopted by the Law of the Sea Conference, would serve as the precedent which the Third World fully intends it to be, notwithstanding the anomalies that would inevitably result.[106] There also is no doubt that a system that guarantees the Soviet Bloc representation which is not justified by technological and financial performance and minerals capacities discriminates against all other States. Such a system should not be imposed on ocean mining, nor be allowed to serve as a model for other international institutions.

To bring the problem of precedential effects more clearly into focus, one need only point to efforts by the Third World to restructure international financial development and monetary institutions.[107] If the Third World succeeds in restructuring the World Bank and International Monetary Fund or in establishing a Common Fund on the model of an international democracy of States, the consequences for the United States could be extremely serious. U.S. economic interests would fare as well in those forums as its seabed resource interests would fare in the Authority. The result could be both economically damaging to the United States and internationally inequitable.

It is inconceivable that the U.S. Senate would accept a treaty involving a decisionmaking process which would make U.S. access to deep ocean minerals uncertain and which would undermine the ability of the United States to protect its interests in global institutions. Fortunately, the U.S. delegation has perceived this political fact and is seeking to resolve the issue of Authority decisionmaking in an acceptable manner.

I. *Grandfather Rights and Security of Tenure*

The United States traditionally has asserted that there must be grandfather rights for mining operations commenced prior to the

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105. *1977-78 Hearings*, *supra* note 19, at 148-49 (statement of Richard Darman, Harvard University).

106. *Id.* at 147.

107. *Id.* at 132.

treaty's effective date. Although the U.S. delegation has not defined such rights, Congress has attempted to do so in pending ocean mining legislation.[108] The Group of 77, however, has condemned unilateral ocean mining, declaring its unalterable opposition to grandfather rights.[109] This resulting impasse threatens to destroy the treaty.

Security of tenure for operators authorized to mine pursuant to the seabed regime also is a difficult issue which remains unresolved. The industry maintains that security of tenure is necessary for ocean mining,[110] and the U.S. delegation and Congress adhere to this view. The Group of 77 resists security of tenure because it requires that the conditions for maintaining an authorization to mine do not change substantially during the course of the project. The developing countries want to be certain that if the original plan of work fails to implement their policies, revisions may be made. Again, the positions of the developed and developing countries appear to be irreconcilable.

The U.S. Senate is unlikely to approve a treaty which failed to provide grandfather rights to protect massive U.S. investments and security of tenure to provide meaningful assured access.

J. *Discretion in the Authority*

Despite resistance by the Group of 77, the United States has sought a high degree of confidence for the procedure by which the Authority acts upon applications to mine and reviews and modifies its authorizations. The Conference negotiating texts, however, set out a system that reflects the Third World position.[111] Implementation of the important powers and functions of the Authority is discretionary. Determinations of applicants' qualifications and the procedures by which they are selected and authorizations made lack

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108. *See, e.g.*, Title II of the Deep Seabed Hard Mineral Resources Act, as passed by the House of Representatives on July 26, 1978. H.R. 3350, 95th Cong., 2d Sess., 124 CONG. REC. H7341 (daily ed. July 26, 1978).

109. *See* Statement Declaring the Position of the Group of 77 on Unilateral Legislation Affecting the Resources of the Deep Seabed, 2 SWP—NEW YORKER SESSION, *supra* note 49, at 275 (Ambassador Nandan, Chairman). Ambassador Nandan stated: "The Group cannot be expected to alter its long-standing and well-stated position rejecting the recognition of acquired rights. We cannot be expected to give a cloak of legality to what is illegal ab initio [*sic*]." *Id. See also* 2 SWP—NEW YORKER SESSION, *supra* note 49, at 279-80.

110. Their position is dictated by the fact that an investment of approximately one billion dollars is required for each operation. *See* A. Lane, Managing National Ocean Resources, Third Annual Seminar on United States Ocean Policy 12 (Jan. 7-10, 1979) (unpublished).

111. ICNT, *supra* note 8, arts. 150, 151, 158, 160, Annex II.

predictability.[112] Unless the United States succeeds in greatly limiting discretion, there will be no assured access. A discretionary Authority also would be poor precedent for other international institutions. Notions of due process and simple equity would suffer serious setbacks in the international community.

The U.S. Senate can be expected to have grave reservations concerning the acceptability of a treaty which conforms to the current negotiating texts. The Senate certainly would not permit considerable discretion in an international organization, at a time when it resists concentrated discretion in the executive branch of the U.S. government.

K. *Balance in the Dual Access System*

A competitive balance between the Enterprise and State and private companies has a direct bearing on the question of access and the issue of precedential effects. This balance is a function of (1) funding and tax treatment of the Enterprise; (2) revenue sharing; (3) transfer of technology and other conditions of mining; (4) the banking system; (5) the quota system; (6) the review conference; and (7) institutional bias.

Funding of the Enterprise is a serious problem. The United States has agreed to Third World demands for a system of funding which would allow the Enterprise to begin operating shortly after the treaty became effective.[113] This system involves State subscriptions,[114] loan guarantees by States, voluntary contributions, and funding from revenue sharing. The funding system may not adversely affect the competitive position of State enterprises because the companies are nationally owned or directly subsidized to promote national policies. Nonetheless, such a system might create an advantage for the Enterprise over private companies, which need time to find willing investors.

The Group of 77 insists that the Enterprise not be subject to national taxation.[115] This position seems to be ideological. The U.S. delegation does not support the Group of 77's view,[116] yet the negoti-

112. *Id.*

113. 1977 Report, *supra* note 45, at 8.

114. Subscriptions will be on the U.N. scale. Consequently, the United States will provide approximately 25% of the fundings.

115. This position is reflected in the ICNT, *supra* note 8, art. 184, Annex III, para. 11(*e*).

116. *1977-78 Hearings*, *supra* note 19, at 88, 128. The United States main concern is assuring that each side of the parallel system has equivalent burdens.

ating texts provide for tax immunity.[117] Private enterprises would not enjoy such immunity. Considering that the maximum federal corporate tax rate in the United States is forty-six percent,[118] the competitive advantage to the Enterprise over State and private companies would be considerable.

The extent to which the Enterprise would be required to pass its revenues to the developing countries is unclear.[119] The Third World seeks to assure that the same high front-end and long-term financial burdens that may threaten the viability of State and private enterprises would not be imposed upon the Enterprise.

Mandatory technology transfer probably would allow the Enterprise to gain sophisticated technology at less than commercial value.[120] The Enterprise would be able to choose the best available technology and would receive proven technology at the outset, instead of engaging in long and costly research and development.

Other conditions of obtaining and maintaining mining rights also could affect the competitive balance. Unless the Enterprise and State and private operators were subject to the same requirements, such as environmental, conservation, or safety regulations, the Enterprise would have a competitive advantage. The Group of 77 continues to resist efforts by developed countries to ensure that both sides of the dual system operate under the same regulatory constraints.[121]

As contemplated by the Group of 77, the banking system would provide the Enterprise with mine sites explored by State and private enterprises seeking authorizations to mine.[122] The United States has agreed to provide the Enterprise with prospected mine sites, but has not conceded on the issue of explored sites.[123] There is a very great difference between the two types of sites, because the cost of exploration vastly exceeds the cost of prospecting.[124] In addi-

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117. ICNT, *supra* note 8, art. 184, Annex III, para. 11(e).

118. I.R.C. § 11(b), (c).

119. *1977-78 Hearings*, *supra* note 19, at 128.

120. This is a function of the reality that a forced sale rarely results in the seller receiving full commercial value. There is no real negotiation under the contemplated system. *Id.* at 93. This problem is compounded because the Group of 77 supports a highly politicized system of dispute settlement for technology transfer. *Id.* at 94.

121. *1977-78 Hearings*, *supra* note 19, at 71. *See* ICNT, *supra* note 8, Annexes II & III; NG-1 Statement, *supra* note 49, at 238.

122. ICNT, *supra* note 8, Annex II, para. 4(j)(i).

123. *Id.*; *1977-78 Hearings*, *supra* note 19, at 88.

124. The cost of exploring one site is estimated to be between $16.4 and $50.7 million, depending on vessel costs. The cost of prospecting one site is estimated to be approximately $1.6 million. J. Nyhart, *supra* note 43, at 129.

tion, the cost in each case would be front-end, and therefore, particularly onerous. Thus, the Group of 77 approach would provide the Enterprise with a huge competitive advantage over State and private operators while the U.S. proposal would result in less disparity between the two groups.

The quota, antimonopoly, or antidensity system likely would apply only to State and private enterprises. Thus, the Enterprise could enjoy an enormous economic advantage by virtue of its ability to operate a large number of sites. The economies of scale for transportation, for example, could be considerable.

The review conference also would likely operate only to the disadvantage of State and private enterprises. States entering the system would face a massive initial investment which probably would have to be recovered profitably in only one operation, and the expectation of further operations would be limited or denied entirely.

Finally, it would be naive to expect that the Authority, controlled by the developing countries and run primarily for their benefit, would not have an institutional bias in favor of the Enterprise. To the extent that the Authority's powers are discretionary, bias could be decisive. Even without substantial discretion, institutional bias could be detrimental to the competitive position of State and private operators.

Looking ahead to the exploration and exploitation of other common global resources and to the use of common areas, any seabed mining Enterprise could provide a precedent, and might herald a global shift away from State and private enterprise. More importantly an Enterprise enjoying a privileged competitive position could endanger the future of State and private development and use of the global common areas. In either case an Enterprise politically dominated by and operated for the benefit of the Third World would create a precedent having uncalculably serious consequences. Could the United States afford to see Antarctica developed, or outer space utilized, in this manner? The extent of the mineral and living resources of Antarctica and the communications and potential energy uses of space suggest not, and it is doubtful that the U.S. Senate would view the situation differently.

III. OTHER ELEMENTS OF THE LAW OF THE SEA TREATY AND THE NO-TREATY ALTERNATIVE

A. *Nonseabed Aspects of the Treaty*

The anticipated nonseabed provisions of the future Law of the

Sea treaty would provide insufficient benefits to the United States to justify a deep seabed regime which lacks assured access and creates undesirable precedents. Moreover, certain nonseabed elements could have negative effects on important U.S. interests.

Admittedly, the negotiating texts and the continuing talks indicate that the treaty probably will contain the following positive elements:

1. A fixed maximum breadth of twelve miles for the territorial sea;[125]
2. A fixed maximum breadth of 200 miles for the economic zone;[126]
3. A reasonably fixed and identifiable outer limit for the continental shelf subject to coastal-State jurisdiction for the purposes of development of natural resources;[127]
4. A uniform fisheries regime that provides for effective conservation and full utilization, including:[128]
   a. Coastal-State preferential rights to the harvest and foreign State rights to the surplus within the economic zone;[129]
   b. Coastal-State control over anadromous species, such as salmon throughout their range;[130]
   c. Some international cooperation in the conservation and utilization of highly migratory species, such as tuna;[131]
5. Additional international protection of marine mammals;[132]
6. Protection for transit through international straits overlapped by territorial seas;[133]
7. A special regime for archipelagic States which would

125. ICNT, *supra* note 8, art. 3.

126. *Id.* art. 57.

127. *Id.* art. 76 does not reflect the degree of certainty concerning the outer limits of the continental shelf which is likely to emerge from the negotiations. *See* 1978 Report, Pt. 1, *supra* note 31, at 23-25; 1978 Report, Pt. 2, *supra* note 17, at 17-18.

128. ICNT, *supra* note 8, arts. 61-62.

129. *Id.* art. 62(2).

130. *Id.* art. 66.

131. *Id.* art. 64 & Annex I.

132. *Id.* art. 65 fails to reflect the degree of protection for marine mammals that is likely to emerge from the negotiations. *See* 1978 Report, Pt. 2, *supra* note 17, at 20.

133. ICNT, *supra* note 8, art. 38.

provide protection for transit through archipelagic waters;[134]

8. Additional protection of the marine environment;[135] and

9. Additional measures for the peaceful settlement of disputes.[136]

Although these elements are certainly useful, they do not constitute a great advance over present customary international law. They also do not restrain hard-line territorialist States, such as Peru, and probably do not offer a serious prospect for rolling back existing inconsistent claims such as the 200- and 50-mile security zones declared by North Korea.[137] The positive elements of the treaty, however, probably would increase the prospects of achieving uniformity of claims, as well as marginally retard the erosion of maritime rights and interests.

Among the likely negative aspects of the treaty are:

1. A dangerous ambiguity in the allocation of coastal-State and international community rights in the economic zone, that is, uncertainty with respect to where coastal-State rights over resources end and maritime rights begin;[138]

2. A highly restrictive and burdensome regime for foreign marine scientific research in the economic zone;[139]

3. Severe limitations on dispute settlement which is both compulsory and binding, so that the exercise of coastal-State sovereign rights, enforcement authority, and any decision with respect to foreign research in the economic zone is or may be effectively excluded;[140]

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134. *Id.* art. 53.

135. *Id.* arts. 193-238; Alternative Texts, *supra* note 11, at 79-98. *See also* 1978 Report, Pt. 2, *supra* note 17, at 21-23.

136. ICNT, *supra* note 8, arts. 187-92, 279-97, Annexes IV-VII; Alternative Texts, *supra* note 11, at 99-108. *See also* Sohn, *Settlement of Disputes Relating to the Law of the Sea Convention*, 3 ENVIR. POL'Y & L. 98-100 (1977).

137. GEOGRAPHER, U.S. DEP'T OF STATE, LIMITS OF THE SEAS No. 36, at 153 (3d rev. 1975); LIBRARY OF CONGRESS, SECURITY ZONE CLAIMS BY VARIOUS NATIONS, *citing* FOREIGN BROADCAST INFORMATION SERVICE, DAILY REPORT, ASIA AND PACIFIC D6 (Aug. 1, 1977). The 200-mile claim, in fact, relates to the economic zone in the Yellow Sea, where delimitation limits the geographical scope of the claim generally to 50 miles.

138. ICNT, *supra* note 8, arts. 56, 58; *1977-78 Hearings*, *supra* note 19, at 197-98.

139. ICNT, *supra* note 8, arts. 56, 239-78; 1978 Report, Pt. 1, *supra* note 31, at 34-35; 1978 Report, Pt. 2, *supra* note 17, at 23-24.

140. *See* note 136 *supra*; *see, e.g.*, ICNT, *supra* note 8, arts. 191, 296-97.

4. A flag-State right to preempt a wide range of coastal-State enforcement actions with respect to environmental protection in the economic zone.[141]

The ambiguity in the regime of the economic zone makes uncertain the freedom of navigation in the most important thirty percent of ocean waters.[142] Efforts to specify that these waters would remain high seas have been resisted by the coastal States, as have efforts to preserve navigation and communication rights in unambiguous language.[143] This implies that coastal States do not intend to preserve those rights.

Most marine scientific research is and ought to be carried out within 200 miles of the coast; but there are numerous excessive restrictions in the negotiating texts on foreign marine scientific research within the economic zone.[144] Also, the conditions which coastal States may place on research would entail considerable additional expense and practical difficulty.[145] Those restrictions and conditions threaten to cause opposition by the U.S. scientific community to treaty ratification. A number of influential representatives of that community maintain that they would be better off negotiating access to the economic zones on a strictly bilateral basis, rather than within the context of the new Law of the Sea treaty. Admittedly, however, a minority of scientists believe that the very existence of the negotiating texts has set the pattern for unilateral legislation and bilateral negotiations, and therefore, the treaty would not cause major additional difficulties.

The practical effect of the Law of the Sea treaty for peaceful settlement of disputes would be limited because the texts restrict dispute settlement on precisely those matters that are most likely to lead to disagreement. In particular, coastal-State resistance to compulsory and binding dispute settlement for key aspects of the economic zone regime has negative implications for maritime powers, distant water fishing nations, and researching States.

Flag-State preemption of certain coastal-State enforcement actions in the economic zone is appealing to maritime nations. The United States is a maritime power, but it is also the second largest

141. ICNT, *supra* note 8, art. 229; Alternative Texts, *supra* note 11, at 93-94; 1978 Report, Pt. 2, *supra* note 17, at 21-22.

142. Communication is affected similarly. *See 1977-78 Hearings*, *supra* note 19, at 197-98.

143. *Id.*

144. ICNT, *supra* note 8, arts. 56, 239-78.

145. *See, e.g., id.* arts. 247, 249, 250.

coastal State and its concern for the environment is noteworthy.[146] The U.S. environmental community thinks that flag-State preemption, however carefully conditioned, cannot be reconciled with the goal of effective environmental protection.

In summary the nonseabed aspects of the negotiating texts present numerous difficulties which are sufficiently significant to question the treaty's acceptability to the U.S. Senate, regardless of the treaty's terms concerning the seabed regime. Therefore, acceptance of an unfavorable deep seabed regime could not be justified by the benefits to be derived from other elements of the treaty.

B. *The No-Treaty Alternative*

A sound, comprehensive Law of the Sea treaty is in the interests of the United States. The previous discussion, however, shows that from the U.S. standpoint the negotiating texts are, and are likely to remain, deficient. In assessing the acceptability of those deficiencies, the assumption has been that the United States has the alternative of not becoming a party to a new Law of the Sea treaty. The remaining question is whether the asumed no-treaty alternative is realistic.

The world situation, in the absence of a comprehensive Law of the Sea treaty, can be predicted from the current negotiating texts the directions of the ongoing talks and trends in State practice. These factors indicate that the negotiating texts represent a model for the minimum coastal-State regime, although some coastal States such as the United States are unilaterally claiming less jurisdiction than the negotiating texts would allow. The majority of coastal States, however, are making jurisdictional claims which closely parallel the negotiating texts or which far exceed what the texts sanction. As of December, 1978, eighty-four States claimed a 200-mile economic zone, twenty-eight claimed a 200-mile fisheries zone, and eleven claimed a 200-mile territorial sea.[147] If the jurisdictional claims are analyzed on a regional basis, it is found that:

1. In the African region comprised of thirty States, eight-

146. In recent Conference sessions, the U.S. delegation has undertaken substantially increased efforts to maximize protection of the marine environment in the treaty. *See* 1978 Report, Pt. 1, *supra* note 31, at 32-34.

147. Krueger & Nordquist, 200-Mile Zones; State Practice in North America, East Asia and Oceana App. A (n.d.) (unpublished). As of December 1, 1978, six non-independent territories also had 200-mile zones. *Id. See also* Geographer, National Maritime Claims (Nov. 7, 1978) (unpublished).

een had 200-mile claims (nine economic zones, two fisheries zones, and seven territorial seas);

2. In the East Asia and Pacific region comprised of thirty-one States, twenty-two had 200-mile claims (fourteen economic zones, seven fisheries zones, and one territorial sea);

3. In Europe comprised of twenty-two States, fifteen had 200-mile claims (four economic zones and eleven fisheries zones);

4. In South America comprised of seventeen States, fifteen had 200-mile claims (six economic zones, one fisheries zone, and eight territorial seas);

5. In North America and the Caribbean comprised of twelve States, nine had 200-mile claims (four economic zones and five fisheries zones);

6. In the Near East and Asia comprised of nineteen States, six had 200-mile claims (all economic zones).[148]

Ten years earlier, in 1958, only six States had 200-mile claims.[149] Now approximately twenty additional States each will gain 25,000 square miles or more if they make 200-mile claims.[150] Given these facts and the current trend in favor of 200-mile claims, it is likely that with or without a treaty, 200-mile claims will become the nearly universal rule.[151]

The treaty probably would not roll back existing claims which exceed the limits permitted States Parties, yet it almost certainly would result in an expansion of most claims to the maximum allowed by the agreement. To think otherwise is to ignore history.[152]

The situation with respect to claims would not be greatly different in the absence of the treaty, as the negotiating texts on this issue are clearly regarded as normative by most of the international community. Some additional extensions of jurisdiction beyond that reflected in the texts, however, might result if the treaty did not enter into force and were not widely ratified.[153]

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148. Nossaman, Krueger & Marsh, (n.d.) (unpublished).

149. 2 NEW DIRECTIONS IN THE LAW OF THE SEA 873-74 (Lay, Churchill, Nordquist, eds. 1973).

150. Nossaman, Krueger & Marsh, *supra* note 148.

151. 2 NEW DIRECTIONS IN THE LAW OF THE SEA, *supra* note 149, at 873-74.

152. *Id.*

153. The exercise of community rights would suffer more in that case, but probably only to a limited extent. See Darman, *The Law of the Sea: Rethinking U.S. Interests*, 56 FOREIGN AFF. 373 (1978).

With respect to international straits passage and transit of archipelagos, absent a Law of the Sea treaty, economic and military imperatives probably would result in regimes similar to those provided by the texts. The interests of naval powers in strategic mobility and of the world community in commercial movement probably would dictate the result.[154]

The continental shelf regime is established in the Continental Shelf Convention[155] and customary international law. The existence of a Law of the Sea treaty will not substantially affect this regime, except possibly to make the outer edge of the shelf more uniform.

It is clear from informal discussions among all the States likely to engage in deep seabed mining in the foreseeable future that without a treaty, deep seabed mining would proceed as a freedom of the high seas.[156] Access would be assured, yet a new international bureaucracy, with all its likely expense, bias, uncertainty, and adverse precedential impact would be avoided. Bilateral and multilateral agreements among ocean mining States would avert conflicts. Third World reaction probably would be limited to political protests and legal challenges. Physical interference with mid-Pacific mining operations would be illegal and logistically impossible for all but blue-water vessels and inevitably would bring a decisive response.

V. CONCLUSION

The Law of the Sea Conference is negotiating a treaty which is likely to be unacceptable to the U.S. Senate. Assuming that the current negotiating texts are largely reflective of the final outcome, access to deep ocean minerals would not be assured for the United States. In addition, harmful precedents would be created by the deep seabed regime for a wide range of important existing and anticipated international arrangements. Given the substantial problems of the treaty, it is highly unlikely that such a regime could be justified by the possible benefits which the treaty would provide to the

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154. *Id.*

155. Convention on the Continental Shelf, *done* Apr. 29, 1958, 15 U.S.T. 471, T.I.A.S. No. 5578, 499 U.N.T.S. 312. *See also* Multilateral Treaties in Respect of Which the Secretary-General Performs Depositary Functions 486-87, U.N. Doc. ST/LEG/SER.D/9 (1976); North Sea Continental Shelf Cases (Federal Republic of Germany v. Denmark; Federal Republic of Germany v. Netherlands), [1969] I.C.J. 3.

156. This is the clear position of the United States and most other developed countries possessing the requisite technology. Provisional Summary Record of the 109th Plenary Meeting, U.N. Doc. A/CONF.62/SR.109 (prov. ed. 1978), SWP—NEW YORKER SESSION, *supra* note 49, at 123.

United States. The no-treaty alternative would be tolerable with respect to nonseabed matters and perferable with respect to deep ocean mineral development.

If the U.S. Senate is to approve the treaty, the United States must reverse the trends of the deep seabed negotiations. U.S. concessions, however, may have led the Conference down a path from which there is no return. That a reversal could be accomplished is, therefore, doubtful. Nevertheless, this substantial doubt must be weighed against the near certainty of Senate disapproval of the treaty if the Conference trends remain unchanged.

POSTSCRIPT

Following the completion of the galleys for this article, the spring 1979 meeting of the Law of the Sea Conference produced Revision 1 of the ICNT.[157] The new text reflects improvements in some respects, but also presents additional serious problems and consolidates earlier deficiencies.

Under the new text, access to deep ocean minerals is not assured and adverse precedents are not eliminated. Indeed, access is even more uncertain in some respects and adverse precedential effects are more numerous.

I. DEEP SEABED PROVISIONS

A. *Transfer of Technology*

Mandatory transfer of ocean mining technology not only to the Enterprise, but also to developing countries remains.[158] Dispute settlement procedures for technology transfer do include a reference to UNCITRAL Arbitration Rules, which are considered fair, but the text provides that the Authority may issue its own arbitration rules.[159] The prospects for an unfair, politicized procedure are, therefore, considerable.

There is a new obligation in the Revision, as well:

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157. Informal Composite Negotiating Text/Revision 1, U.N. Doc. A/CONF.62/WP.10/Rev.1, (1979) [hereinafter cited as ICNT Rev. 1].

158. *Id.*, Annex II, art. 5. The provision relating to the Enterprise does state that the transfer obligation may be invoked only if the technology is not otherwise available under fair and reasonable conditions. *Id.* para. (c) One should ask what "fair and reasonable means". Normal rules of interpretation would suggest that "commercial" terms are not necessarily contemplated by this provision, as "commercial", appears in other provisions, but not this one. In any case, mandatory transfer, as a forced sale, remains the central problem.

159. *Id.*, para. 2.

> In the event that the Enterprise is unable to obtain appropriate technology on fair and reasonable commercial terms and conditions to commence in a timely manner the processing of the minerals it recovers from the Area, the States Parties which are engaged in activities in the Area or whose nationals who are engaged in activities in the Area, and other States Parties having access to such technology shall consult together and shall take effective measures to ensure that such technology is made available to the Enterprise on fair and reasonable commercial terms and conditions.[160]

This is clearly a potentially expensive obligation on States Parties and suggests substantial government intervention in the marketplace. The provision, which involves land-based operations, goes far beyond what a Law of the Sea treaty ought to encompass and most certainly establishes a very bad precedent.

Moreover, technology under the new text is now expressly defined to include know-how and training, as well as all other aspects of technology. The transfer obligation now also extends to operation and maintenance.[161]

B. *Production Ceiling*

The new text does not improve the production ceiling provision.[162] A major U.S. effort failed to achieve, among other things, a formula to guarantee continued seabed production even when the nickel market falls substantially. Moreover, the text now contemplates extension of the ceiling beyond its initial term and the Enterprise now has an absolute priority over State and private operators, when the ceiling forces a selection among them.[163] This is clearly unacceptable, as it subverts the parallel access sytem by converting it to a clearly unitary system.

C. *Authority Participation in Commodity Arrangements*

In the new text, the Authority retains its power to represent in commodity arrangements not only Enterprise production, but also State and private production.[164] The text is not at all clear as to

160. *Id.*, para. 3.
161. *Id.*, para. 5.
162. *Id.*, ICNT Rev. 1, *supra* note 157, art. 151, para. 2.
163. *Id.*, Annex II, art. 7, para. 4.
164. ICNT Rev. 1, *supra* note 157, art. 151, para. 1.

whether Authority participation in ICA's could be blocked by the United States or other vitally affected countries.

D. *Quota System*

Revision 1 contains detailed antimonopoly and antidensity provisions on the Russo-French model.[165] This reflects a major deterioration of the negotiating texts, insofar as the earlier text, merely contained a statement that, "inclusion of a quota or anti-monopoly provision appears to be acceptable in principle . . . ."[166]

E. *Review Conference*

Revision 1 contains a provision for a moratorium on nodule development 25 years after the treaty enters into force.[167] This, alone, makes the new text unacceptable. This provision is clearly in direct opposition to the position of the United States as forcefully expressed at the last Geneva meeting.

F. *Revenue Sharing*

Revenue sharing provisions in the new text are still inadequate.[168] The contributions remain far too high and excessively inflexible.

G. *Non-Manganese Nodule Minerals*

Revision 1 retains the moratorium on non-manganese minerals.[169] It is difficult to see how this can be justified, in light of the usefulness which thoe minerals are likely to prove to have.[170]

H. *The System of Governance*

The Council provisions are improved, insofar as each category from which members are to be selected by the Assembly for the various chambers is more carefully defined and is better circumscribed to reduce the possibillities of capricious action in the selection process.[171] However, the Soviet Bloc retains an express guarantee of three seats on the Council and the United States continues

165. *Id.*, Annex II, art. 6, para. (d).
166. ICNT, *supra* note 8, Annex II, para. 5(1).
167. ICNT Rev. 1, *supra* note 157, art. 155, para. 6.
168. *Id.*, Annex II, art. 12.
169. ICNT Rev. 1, *supra* note 157, para. 3.
170. *See* discussion, *supra*.
171. ICNT Rev. 1, *supra* note 157, art. 161.

to have no guarantee of participation.[172] The Assembly remains the "supreme organ".[173]

I. *Grandfather Rights and Security of Tenure*

There are no grandfather rights in Revision 1. Security of tenure under the direct access side of the parallel system may have been improved, but a detailed analysis of the many relevant and complex provisions is necessary to attain a respectable degree of confidence on the point. It is at least clear that revocation of authorizations to operate on that side of the parallel system remain unpredictable.[174] There is most certainly no security of tenure for companies operating in joint ventures with the Enterprise.

J. Discretion in the Authority

Although discretion in the Authority to deny all qualified applicants for mine sites licenses to operate has been reduced, the result is still far from acceptable. The criteria for selection among qualified applicants continues to require highly discretionary decisions on the part of the Authority. Among other serious problems, "equitable merit," a very vague concept, plays a role in the selection process.[175] Rules and regulations which might be employed to define that criterion would, in the final analysis, require approval of the one-nation one-vote Assembly.[176] The danger in this situation is self-evident.

K. *Balance in the Dual Access System*

Balance between the Enterprise and State and private operators is not achieved in the new text. Indeed, the problem is aggravated. Not only does the Enterprise retain tax immunity and its right to the technology of private and State operators on a mandatory basis, but also, is provided under a new provision a guaranteed right to 50 percent of initial capital from States Parties in the form of long-term, interest-free loans. Debt guarantees by States Parties (or, alternatively, voluntary contributions) will be made available to the Enterprise in order to meet the balance of its initial capital require-

172. *Id.*
173. *Id.*, art. 160, para. 1.
174. *Id.*, Annex II, art. 17.
175. *Id.*, art. 7, para. 3.
176. *Id.*, art. 160, para. 2(n).

ments.[177] Of course, as noted above, the Enterprise not only retains a guarantee to one-half of the mine sites, but also may compete for the balance and even has an absolute priority to mine sites when the ceiling on production is approached. In sum, as a practical matter, there is not a parallel system, but a unitary system of joint ventures with the Enterprise. There is no assurance of direct access for State and private enterprises.

Other Seabed Issues

The text presents numerous additional difficulties. One in particular, however, deserves mention. Revision 1 makes it completely clear that not only States parties to the treaty, but also, "peoples who have not attained full independence or other self-governing status" are entitled to receive revenues from ocean mining.[178] This includes funding of "national liberation movements," including terrorist organizations. It seems highly doubtful that the Senate would agree to a treaty containing such a provision.

II. NONSEABED ASPECTS OF THE TREATY

Serious deficiencies remain in the nonseabed provisions of the treaty, however, some improvements were made. Provisions relating to protection of navigation and of other international community rights and freedoms are improved in relation to the exercise by coastal States of continental shelf rights.[179] The exercises of economic zone rights, however, remain substantial threats to community interests.[180]

The very poor regime for scientific research in the economic zone was not changed, despite a major effort by the United States to obtain even marginally signficant improvements.[181] The subject does remain open, however.

Dispute settlement procedures are not substantially improved, except the text does include compulsory conciliation for fishery disputes relating to the economic zone.[182] Necessary improvements relating to settlement of other types of disputes, including those arising out of marine scientific research in the economic zone, were

177. *Id.*, Annex II, art. 10, para. 2(c).
178. *Id.*, art. 160, pra. 2(h).
179. *Id.*, art. 78, para. 2.
180. *Id.*, arts. 56, 58.
181. *Id.*, Part XIII, Section 3.
182. *Id.*, art. 296, para. 3.

not achieved.[183]

Flag-State preemption remains in the pollution text.[184] Significant improvements sought by the United States in other environmental provisions, however, were achieved.[185]

CONCLUSION TO POSTSCRIPT

There are some improvements to the ICNT reflected in Revision 1. However, on balance, the prospects for Senate approval of the treaty are only marginally improved, if they are improved at all. This is a result of inclusion in the Revision of some substantially worse provisions than appeared in the ICNT and the failure to achieve important improvements to certain crucial provisions of the texts. The trends of the negotiations continue to suggest that the Senate is unlikely to be presented with a treaty which would be acceptable to it, if a treaty is concluded at all. As a result of Group of 77 pressure to end the negotiations rapidly, the time to achieve accommodations essential to Senate approval is fast running out.

183. *Id.*, art. 296, para. 2.
184. *Id.*, art. 228.
185. *Id.*, Part XII.

Mr. FLIPPO. I believe the committee will stand in recess now until 2 p.m.

AFTERNOON SESSION

The subcommittee met, pursuant to notice, at 2:10 p.m., in room 2325, Rayburn House Office Building, Hon. Ronnie G. Flippo, acting chairman of the subcommittee, presiding.

Mr. FLIPPO. The subcommittee will come to order.

The Subcommittee on Space Science and Applications this afternoon concludes this series of hearings on international space activities.

The witnesses invited to testify today represent key Federal agencies involved in developing space systems, controlling exports of space systems and technology, and insuring implementation of Federal policies on the worldwide use of space and space-derived information.

The witnesses this afternoon are Mr. Kenneth Pedersen, NASA Director of International Affairs; and Mr. Norman Terrell, Deputy Assistant Secretary for Oceans and International Environment and Scientific Affairs, Department of State; Dr. Maurice Mountain, Director of Strategic Technology and Munitions Control of the Office of International Security Affairs, the Department of Defense; and Mr. Kent Knowles, the Director of Office of Export Administration, Department of Commerce.

Before we proceed I will request each witness to present his oral testimony first, and then to respond to questions in a panel format after the last witness has testified.

The issues associated with encouraging worldwide participation and the benefits of space, enhancing the U.S. leadership in high technology, and the export controls implemented in the national interest, involve an economics interaction between the functions of these agencies represented here today.

I believe our first witness will be Mr. Pedersen. Would you please come forward and give us the benefit of your testimony.

Mr. WINN. Mr. Chairman, I was just going to suggest that because of the limitations of time that we might ask all four witnesses to come forward to make their presentations.

Does anybody object to all of you sitting up here as a panel and going right through in the order in which you are listed?

Mr. FLIPPO. Very good.

Mr. WINN. Thank you very much, gentlemen.

Mr. FLIPPO. We appreciate that cooperation.

The House has a bill, I believe, dealing with foreign affairs on the schedule this afternoon which normally results in several trips to the floor.

We would be delighted to have your testimony, Mr. Pedersen.

[The prepared statement of Mr. Pedersen is as follows:]

STATEMENT OF KENNETH S. PEDERSEN, DIRECTOR OF INTERNATIONAL AFFAIRS, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. Chairman, it is a pleasure to be here this afternoon to discuss the role of NASA in international space matters. This is my first opportunity to testify before a Congressional comittee since I became Director of NASA's International Affairs Division earlier this year.

Mr. Chairman, today I would like to describe for you some of the key principles which govern and structure the conduct of NASA's extensive international activities. In the course of this discussion I will touch on several of the issues raised in the report of the panel of experts convened by your Subcommittee in June of last year. In particular, I would like to respond to the Subcommittee's request to address the future direction of international space cooperation.

NASA'S CURRENT INTERNATIONAL ROLE

The National Aeronautics and Space Act of 1958 gives NASA the explicit responsibility to conduct international cooperative activities as an integral part of its primary mission. In keeping with this mandate, NASA has pursued an extensive program of international activity involving over 100 countries, both developing and industrialized. These international undertakings have contributed significantly to meeting NASA's goals in space exploration and the peaceful application of the benefits of space on Earth.

Mutual Benefits

The cornerstone of NASA's international cooperative project philosophy is mutual programmatic benefit. Put most simply, proposed cooperative activities must contribute positively to NASA's program objectives or to broader U.S. interests and must be evaluated in direct competition with domestic proposals. In keeping with the principle of mutual programmatic benefit, each side funds its own responsibilities and activities.

In determining "mutual programmatic benefit," the respective benefits to the cooperating sides can, of course, be measured in various ways. One major consideration, important both to NASA and to our foreign counterpart agencies in assessing future cooperative project possibilities, is the opportunity to reduce total project costs. As suggested by some members of your panel last year, the overall costs of managing a given project on a joint international basis frequently exceed that of doing it on a unilateral national basis. However, sharing of expenses between two or more partners can significantly reduce the cost to each as against doing the project alone, while still allowing the parties to realize the full benefits of the project. Sometimes reduced cost to each partner is the critical factor which makes the project viable.

Through its cooperative activities NASA has been able to draw on the considerable hardware and scientific capabilities of foreign nations, while at the same time reducing the cost to the U.S. of major programs—effectively stretching the program value obtained for U.S. dollars expended. I will mention briefly only a few examples. Well known to this Subcommittee are the European Space Agency's $660 million Spacelab and Canada's $90 million Remote Manipulator System—both important contributions to the Shuttle-based Space Transportation System. In the space science area, ESA is contributing $100 million in hardware and services to Space Telescope. And in the space applications area, the new SARSAT project to detect and locate aircraft and ship emergency beacons by satellite involves Canadian and French hardware contributions which together amount to approximately $20M, or nearly half the total United States-Canadian-French project cost. The project will be further enhanced by the addition of one or more Soviet satellites compatibly equipped, which we expect might cost them approximately $40M.

Financial gain is not the only benefit realized by NASA through international cooperation. In many cases, cooperation allows us to gain access to facilities and flight opportunities as well as new scientific data which could otherwise not be available to the United States. These opportunities are becoming increasingly important as the space-related capabilities and experiences of other nations expand.

Specifically, NASA benefits from access to foreign sites for staging research aircraft and launching sounding rockets. In addition, the Soviets have flown U.S. experiments on two of their biological satellites. A third such satellite carrying 13 U.S. experiments is scheduled to be launched later this month. These missions have provided important flight opportunities for U.S. scientists during a period of no comparable U.S. opportunities. In space medicine, our arrangements for sharing detailed medical and physiological data from all manned space flights have given us access to valuable information gained during the Soviets' pioneering long duration flights. In the planetary area, data exchange agreements have allowed U.S. scientists valuable insight into the results of Soviet missions to Mars and Venus. Both we and the Soviets sent probes to Venus last December, and the

full data return from the two missions is being evaluated in joint studies, allowing U.S. scientists to interpret Soviet data alongside data from the U.S. mission.

Project-by-Project Approach

In addition to insisting on demonstrable mutual benefits, NASA concludes all of its cooperative arrangements through project-by-project agreements. As a matter of policy, we avoid umbrella or open-ended agreements which may unreasonably raise expectations without defining a realizable set of results. Instead, we aim for finite project activities with specified responsibilities on each side and concrete milestones against which to measure accomplishments. These agreements may take the form of an exchange of letters between officials at NASA and a civilian counterpart agency abroad or may be incorporated in a more formal Memorandum of Understanding, sometimes accompanied by an intergovernmental exchange of notes. The subjects of these agreements have varied in scope from joint analysis of satellite data to development of significant hardware elements for the Space Transportation System and for major spacecraft missions. The past two decades of cooperative activities have produced more than 1,000 project-type agreements.

Open Availability of Data and Results

In its international (as well as domestic) dealings NASA also places high priority on the principle of widespread, public availability of data and results. While appropriate consideration is, of course, given to the rights of Principal Investigators to have first access to data from their experiments, provisions are made to make the results of NASA missions available to the international scientific community both through data depositories and through requirements on investigators for early publication of results. In international cooperative projects, results are exchanged between NASA and the foreign sponsoring agency and are made available to the world scientific community. Perhaps the best known example of this open approach is the experimental Landsat program in which NASA has assured international availability of satellite R&D data through cooperative arrangements for direct reception of the U.S. data by foreign ground stations and through an open data dissemination policy under which data can be purchased at reasonable cost on a nondiscriminatory basis from the U.S. EROS Data Center and the foreign stations.

U.S. Leadership

A fourth theme which has guided NASA's international activities, and which was of particular interest to your panel, has been the importance of maintaining U.S. leadership in space science and technology. President Carter last fall emphasized his commitment to the goals of "assuring American scientific and technological leadership in space for the security and welfare of the nation * * *," while at the same time "fostering space cooperation with other nations by conducting joint programs".

NASA's cooperative programs are designed to avoid the leakage of critical U.S. technology. Prior to entering into a proposed cooperative undertaking, we assure ourselves that not only does our cooperating partner have the financial resources but also has a demonstrated technical capability to carry out its own responsibilities, so that the export from the United States of sensitive advanced technology is minimized. Moreover, responsibilities are structured and implementation plans defined so as to assure full protection of industrial proprietary rights on both sides.

Later in this testimony I will address some of the technical areas in which the United States faces growing foreign competition and how this competition relates to future international space cooperation.

II. FUTURE DIRECTIONS

Having briefly outlined four of the key operating principles which structure NASA's role in international space cooperation, let me now share with you some thoughts about the future, relating them as appropriate to the priniciples just discussed.

Broadened View of Mutual Benefit

There is no question that mutual programmatic benefit must continue to be a primary NASA concern in considering international cooperative ventures. There is every reason to expect that many of the future programs to be undertaken by

NASA, involving increasingly sophisticated technologies and such ambitious challenges as construction of large structures in space and more complex and extended missions to the planets, will be increasingly costly. In the face of a continuing requirement to exercise prudent fiscal restraint, NASA will continue to give careful consideration to the possibilities for reducing the costs of these projects to the United States through international arrangements. Obviously, economic constraints will not be limited to NASA. NASA's foreign counterpart agencies have always recognized the need for international cost-sharing if some of the most interesting missions, particularly in the space science field, are to be accomplished.

I believe it will be particularly important in the future for NASA to retain flexibility in defining and evaluating the benefits to be gained from cooperative space projects. I am thinking particularly about our dealings with developing nations which have neither the financial resources nor technical expertise to match those which NASA can bring to a particular project. The importance of increasing the developing nations' participation in space activities and increasing the benefits they derive from space technology was specifically recognized in the recommendations of your panel and is a commitment which NASA shares with other agencies of the U.S. Government.

Developing countries have shown special interest in utilizing satellite remote sensing techniques for discovering, extracting and better managing natural resources. Many developing nations are already regularly using data from NASA's Landsat satellites in a wide variety of self-help projects; two (Brazil and India) are operating receiving stations to obtain Landsat data directly and several more are planning such stations. This growing interest in remote sensing among developing nations comes at a time when NASA is making plans for enhanced satellite remote sensing capabilities for the 1980's. The views and needs of these user countries will be taken into consideration in this planning process. With this in mind the U.S. delegation to the U.N. Conference on Science and Technology for Development, held last month in Vienna, offered American assistance in helping developing countries set up meetings, on a regional basis, for an exchange of views on current remote sensing experiences as well as prospects for further use of satellite remote sensing techniques in the 1980's. NASA is ready to participate actively in these proposed meetings through the provision of both information and experts.

In its report the Subcommittee's Panel specifically recommended that NASA consider special pricing policies for developing country use of remotely sensed data, launch services, and the like. This recommendation takes into account the fact that some developing countres may be ill equipped to pay for highly beneficial space-related activities. While NASA shares the Panel's desire to assure that developing countries are able to fully take advantage of the space technologies we have developed, it would be extremely difficult in practice to devise a cost schedule which would take into account the wide diversity of economic circumstances characterizing the broad class of nations called "developing". A preferable approach would be to encourage greater LDC use of space systems through loan and technical assistance programs targeted toward countries unable to finance such capabilities on their own. This technical and funding support is currently available through U.S. and foreign development assistance programs and through international lending institutions such as the World Bank. I would hope that it will be continued and increased in the years ahead.

Another recent example of the importance of maintaining a flexible approach to the definition of mutual benefit is NASA's recently initiated discussions with the People's Republic of China (PRC). In his message to Congress last March on national science and technology policies, the President noted that "most nations value scientific and technological cooperatio with the United States (and that) we can use this fact to build bridges with countries where official relationships have been strained or absent." China has declared science and technology to be a key element in its modernization efforts. As a result of discussions between NASA and the Chinese delegation, an Understanding on Cooperation in Space Technology was concluded as a part of the United States-PRC Agreement on Cooperation in Science and Technology, signed on January 31, 1979. The Understanding provides for China to purchase from U.S. industry, under suitable conditions, a U.S. satellite broadcasting and communications system, including the associated ground receiving and distribution equipment and a ground station capable of receiving earth resources data from the NASA Landsat remote sensing satellites.

It seems apparent that space cooperation of this type can be of direct benefit to China in meeting its objectives to improve education and the utilization of its agricultural resources. At the same time, such cooperation can be of substantial benefit to the United States in terms which go beyond strict mutual programmatic benefits. This is true both in a commercial sense and with respect to this country's broader foreign policy interest in a strong, secure China with an important role to play in preserving world peace.

Advance Coordination

I noted with interest, Mr. Chairman, that in last year's hearings, interest was expressed to your subcommittee in providing for earlier intergovernmental discussions focusing on future space plans so that budget planning and relations with legislative branches here and abroad can proceed within the context of a long range view. I agree with your panel report that these interactions should not be so formalized on an international basis as to replace the current project-by-project approach through agency-level channels. At the same time, if we are to undertake significant cooperative activities, we and our foreign partners must be in a position to identify fertile areas for prospective cooperation early enough to allow each side to make the necessary advance funding and technical preparations in the context of its other national activities. Similarly, a basic mutual understanding of our respective capabilities, objectives, and plans will allow both us and our foreign partners to make program and policy decisions in a more fully informed environment.

I believe, Mr. Chairman, that we are making good progress in assuring that this vital information exchange process functions effectively. We currently conduct periodic meetings to exchange space science and applications program planning information with the Canadians, the European Space Agency and the United Kingdom. We have also exchanged information with the Soviets on future planetary program plans with a view to avoiding overlap in this very costly area of space activity. In the remote sensing area, NASA will be continuing discussions with France, ESA, Canada, Japan and representatives of various user nations to explore ways of harmonizing future national systems in order to achieve maximum usefulness to both the satellite operators and users worldwide—particularly to the developing countries where scarce resources do not permit the luxury of unnecessarily sophisticated data handling capabilities. In the near term, this means encouraging the the ground work for future nationally-operated remote sensing satellites which are complementary and mutually beneficial.

A specific case where we expect to realize the value of undertaking a broad, across-the-board exchange of program plans is in our recent discussions with the Japanese. Last year we established a Joint Study Group to discuss our respective science and applications programs with a view to increasing the scope and level of our cooperative space activities. Based on this year-long review, the Study Group identified seventeen areas for prospective cooperative projects. The Study Group recommendations have been reviewed in Japan and at NASA and approved for implementation. These proposed joint activities in applications and science include both near-term efforts and possible future projects—from, for example, use of each side's existing data for coordinated study of winds and waves caused by typhoons in the Pacific, to undertaking of a joint mission design study for possible Japanese contribution of pre-entry science packages for probes that will sample the atmospheres of Saturn and Titan in the late 1980's.

Draft agreements to implement each of the projects are not being reviewed by both sides. Following up the successful conclusion of the work of the Study Groups, we and the Japanese are studying the establishment of a standing liaison group to assess the implementation of agreed projects and to identify possible new projects. I believe this type of joint assessment of future plans will assist NASA in it own planning endeavors and will put us in a position, as recommended by your panel, to inform Congress more effectively about our long range international space science goals and programs.

Growing Competition

While I anticipate that opportunities for new international cooperation will continue to emerge, it is clear that international competition exists, and will be increasing. In addition to the longstanding U.S./Soviet space competition, we are now seeing the emergence of other foreign space capabilties in such areas as communications satellite technology, remote sensing and space launchers. In part, the development of these foreign capabilities is the inevitable result of maturing space programs in Western Europe, Canada and Japan. It is also spurred on by an increased recognition of the potential economic benefits of space activities.

For example, a number of foreign governments are giving high policy attention to developing a national industrial capability in communications satellites, with a view to gaining an enlarged piece of this growing international market. Japan is actively striving to develop such capabilties not only in satellites but also in associated ground equipment such as small, low-cost receivers for direct home TV reception. France and Germany have developed advanced expertise in point-to-point and broadcast satellite and ground segment technology. Both countries are working on the development of high-power tubes for satellite use (which until recently only the United States had successfully manufactured), and joint French-German development of an operational direct broadcast satellite program is under serious consideration. The USSR is also developing and launching communications satellites.

In remote sensing, France is developing a polar orbiting sun-synchronous remote sensing satellite, called SPOT, which is scheduled for launch in 1984. A Japanese remote sensing satellite program calling for three marine and two land-oriented spacecraft is underway, with the first launching planned for 1985. The European Space Agency is also planning the development of two dedicated remote sensing satellite missions for 1985 and after. In addition, the Soviets are flying scanners and camera systems on several manned and unmanned missions.

In launch vehicles, the Soviet Union, China and Japan are currently placing satellites into orbit with expendable launch vehicles. The Soviets, who in the past have limited their launchings primarily to domestic and Eastern European payloads, may now be in the process of expanding the international availability of their launch capability. They have recently placed two Indian spacecraft in orbit and are reported to be discussing further launches with other non-Communist groups. The European Space Agency is developing the Ariane vehicle, an expendable vehicle similar in capability to the Atlas Centaur. Ariane's first test flight planned for late this year. India is developing a small Scout-type launcher; although the first test flight last month was a unsuccessful conclusion. Brazil is also planning to deveolp a launch vehicles based on French technology.

In response to competitive developments, we must certainly give renewed high priority, as the Administration does, to advanced research and development aimed at assuring continuation of American scientific and technological leadership. In the last year, for instance, NASA has formally re-entered the field of advanced communications technology research and development, consistent with one of the recommendations of the Subcommittee's panel. NASA's efforts are emphasizing high technology approaches for more efficient frequency and orbit utilization which we believe will be increasingly essential to U.S. industry in the coming decade.

The Space Shuttle, with its enhanced payload capability and mission flexibility relative to expendable launch vehicles, represents another significant step in retaining U.S. space leadership. In anticipation of the benefits of the Shuttle, a number of foreign users are designing satellites or planning Spacelab missions for flight on this new system in the early 1980's. We have received earnest money deposits from agencies in Canada, Germany, India, Indonesia, Intelsat and the Arab Satellite Communications Organization for Space Shuttle launches, primarily for communications satellites, in the early 1980's.

Mr. Chairman, in conclusion I would not want to leave you with the impression that this growing foreign competition is incompatible with expanding international space cooperation. Continuing dialogue aimed at defining carefully structured cooperative efforts has a number of positive advantages, both to the United States and to our foreign counterparts in this changing international environment. In addition to the benefits I mentioned earlier, it permits us to have some influence over the timing and direction of foreign program initiatives. It also keeps us better informed as to foreign intentions and capabilities, making U.S. industry more effective competitors.

Thank you, Mr. Chairman.

STATEMENT OF KENNETH S. PEDERSEN, DIRECTOR OF INTERNATIONAL AFFAIRS, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. PEDERSEN. Mr. Chairman, I would like to summarize my statement, and with your permission make the full statement a part of the record.

Mr. Chairman, it is a pleasure to be here this afternoon to discuss the role of NASA in international space matters.

I would like to describe for you today some of the key principles which govern and structure the way NASA conducts its international activities. I would like to touch on several of the issues raised by your panel of experts that was convened last year. And in particular I would like to respond to the subcommittee's request to address the future direction of international space cooperation.

The cornerstone of NASA's international cooperative project philosophy is one of mutual programmatic benefit. Put most simply, proposed cooperative activities must contribute positively to NASA's program objectives or to broader U.S. interests, and must be evaluated in direct competition with domestic proposals. In keeping with the principal of mutual programmatic benefit, each side in these cooperative endeavors funds its own responsibilities and activities.

In carrying out our international business, in addition to insisting on demonstrable mutual benefits, NASA concludes all of its cooperative arrangements through project-by-project arrangements. As a matter of policy, we avoid umbrella or open-ended agreements which may unreasonably raise expectations without defining a realizable set of results. Instead, we aim for finite project activities with specified responsibilities on each side, and concrete milestones against which to measure these accomplishments.

A third principle on which we place a very high priority, on the principle is widespread public availability of data and results. Perhaps the best known example of this approach is the experimental Landsat program, in which NASA has assured international availability of satellite R. & D. data through cooperative arrangements for direct reception of U.S. data by foreign ground stations and through an open data dissemination policy under which data can be purchased at reasonable cost on a nondiscriminatory basis from the U.S. EROS Data Center and the foreign stations.

A fourth theme which has guided NASA's international activities, and which was of particular interest to your panel, has been the importance of maintaining U.S. leadership in science and technology.

NASA's cooperative international programs are designed to avoid the leakage of critical U.S. tecnhology. Prior to entering into a proposed cooperative undertaking we assure ourselves that our cooperative partners have the financial resources to do the job, but that they also have a demonstrated technical capability to carry out their own responsibilities, so that the export from the United States of sensitive advanced technology is made unnecessary. Moreover, responsibilities are structured and implementation plans defined so as to assure full protection of industrial proprietary rights on both sides.

Having briefly outlined these four principles, which I think are relevant to an understandnig of some of the areas of interest to this subcommittee, I would like to briefly now discuss with you some of the future directions of international space cooperation, particularly as it relates to the principles I have just discussed.

The first is with regard to a broadened view of mutual benefit. I think in my mind there is no question that mutual programmatic benefit must continue to be a primary NASA concern in considering international cooperative ventures. There is every reason to expect

that many of the future programs to be undertaken by NASA are going to be increasingly sophisticated in terms of technology, and are going to be increasingly costly. In the face of a continuing requirement to exercise prudent fiscal restraints, NASA will continue to give careful consideration to the possibilities for reducing costs of these projects to the United States through international arrangements. And I might say that this recognition is not limited to NASA. Our foreign counterpart agencies also realize the need for international cost-sharing. And while it is true they are vigorously pursuing their own independent programs, they continue to cite the key role international cooperation must play in their space activities even as we recognize the importance of that role in our own.

When I speak of the importance of retaining flexibility and defining mutual benefits, I am thinking particularly about our dealings with developing countries, which have neither the financial resources or technical expertise to match those which NASA can bring to a particular project. The importance of increasing the developing nations' participation in space activities was specifically recognized in the recommendations of your panel, Mr. Chairman, and is a commitment which NASA shares with the other agencies of the U.S. Government.

Developing countries have shown a special interest in remote sensing, particularly for discovering, extracting, and better managing their natural resources. I would point out that many developing countries are already regularly using data from NASA's Landsat satellites in a wide variety of self-help projects. And two such countries, Brazil and India, are operating receiving stations to obtain Landsat data directly, and several more are planning such stations.

We believe that it is important that these developing countries have a recognized role to play in the future development of remote sensing capabilities. I wish to assure you that the views and needs of these user countries will be taken into consideration as we plan for the future of remote sensing.

With this in mind the U.S. delegation to the U.N. Conference on Science and Technology for Development, UNCSTD, which was held just recently in Vienna, made a specific offer of American assistance to help developing countries set up meetings on a regional basis for an exchange of views on current remote sensing experiences, as well as prospects for future use of satellite remote sensing techniques in the 1980's. NASA is ready and willing to participate actively in these meetings through providing both information and experts.

In its report the subcommittee's panel recommended that NASA consider special pricing policies for developing countries use of remotely sensed data, launch services, and the like. These are services which developing countries may not be well equipped to pay for on their own.

While NASA shares the panel's desire to assure that the developing countries are able to fully take advantage of space technologies that we have developed, we believe it would be extremely difficult in practice to devise a cost schedule which would take into account the wide diversity of economic circumstances characterizing the broad class of nations called developing.

I would note that many of the benefits, particularly as they relate to such things as meteorological data, Landsat data and the like, the developing countries are already receiving either at no cost or at a nominal cost.

For the more expensive space-related activities we believe a preferable approach would be to encourage greater LDC use of space systems through loan and technical assistance programs targeted toward the specific needs of those countries. This technical and funding support is currently available through U.S. and foreign development assistance programs and through international lending institutions.

And as you are aware, perhaps, Mr. Chairman, the UNCSTD was active in laying the groundwork for an initial fund to assist developing countries in the science and technology area. I would hope that this kind of support could be continued and increased in the years ahead.

In talking about the need to broaden the definition of mutual benefit, a particular example comes to mind; namely, NASA's recently initiated discussions with the People's Republic of China. As you know, President Carter noted in his message to Congress last March on science and technology that most nations value scientific and technological cooperation with the United States, and that we can use this fact to build bridges with countries where official relationships have been strained or absent. China has declared science and technology to be a major element in its modernization efforts.

As a result of our recent signing of an understanding on cooperation in space technology, a NASA delegation recently visited China. And as a result of that visit and the understanding, China has agreed to purchase under suitable conditions a U.S. satellite broadcasting and communications system with the ground station and receiving equipment, as well as a ground station for receiving Earth resources data from the NASA Landsat remote sensing satellites.

It seems apparent that space cooperation of this type can be of direct benefit to China in meeting its objectives to improve education and increase utilization of its agricultural resources. At the same time, such cooperation can be of substantial benefit to the United States in terms which go beyond strict mutual programmatic benefits as normally defined. This is true both in a commercial sense and with respect to this country's broader foreign policy interest in a strong, secure China with an important role to play in preserving world peace.

Your panel also emphasized, Mr. Chairman, the importance that they placed on early and effective coordination and discussions in the international space area, so that developments arising out of these discussions can more effectively be brought to the attention of Congress and others sufficiently far in advance to allow for effective planning and budgeting.

NASA shares this concern. And I believe we are making good progress in assuring that this information exchange is functioning effectively. We have in recent years undertaken to structure periodic meetings to exchange program planning information on space science and applications, with the Canadians, the European Space Agency, and the United Kingdom, among others. In the remote sensing area we have been or will be discussing with France, ESA, Canada, Japan,

and representatives of various user nations to explore ways of harmonizing future national systems in order to achieve maximum usefulness to both operators and users worldwide.

These efforts are somewhat outside the scope of our normal practice of project-by-project approaches, Mr. Chairman. We believe they are not inconsistent with that. We believe in having broad discussions so that we understand what foreign nations are planning in the international area, and so that they have a better understanding of our plans. It will make for an environment in which project-by-project agreements can be more effectively finalized, and we can more effectively plan how to spend our resources. This approach is in keeping with the recommendation of your panel to more effectively keep Congress informed as to our plans.

Japan is a specific case where we expect to realize the value of these broad exchanges. Where we have just recently completed a broad joint study group that has looked across-the-board at our plans and Japanese plans in both the applications and space science area, Mr. Chairman, and as a result of this study group activity, 17 areas were identified where possible fruitful cooperation can take place in the coming years with Japan.

Draft agreements to implement many of these projects are being reviewed by both sides now; and we are very confident that this will result in a very useful and fruitful endeavor for NASA and for the Japanese.

Finally, I would like to say just a word or two about competition. I suspect no witness can easily come up here and talk about cooperation without having a word or two to say about international competition. I personally believe that cooperation and competition are not inconsistent.

Mr. Flippo. Mr. Pedersen, Mr. Winn and I have to go vote, so Mr. Brown will continue the hearings. We will return very quickly.

Mr. Pedersen. Thank you, Mr. Chairman.

We see that a number of foreign governments are giving high policy attention to developing national industrial capabilities in a number of space-related areas, including communications satellites, with an eye toward gaining a large piece of a growing international market.

Japan is actively striving to develop communications satellite capabilities as well as associated ground equipment, such as small, low-cost receivers for direct home TV reception.

France and Germany have developed advanced expertise in point-to-point and broadcast satellite and ground segment technology. The U.S.S.R. is also developing and launching communications satellites.

In remote sensing, France is developing a polar-orbiting, sun-synchronous, remote-sensing satellite called SPOT which is scheduled for launch in 1984. The Japanese also have plans in this area, as does the European Space Agency.

In launch vehicles, the Soviet Union, China, and Japan are currently placing satellites into orbit with expendable launch vehicles. The Soviets, who have limited their launching primarily in the past to domestic and Eastern European payloads, may now be in the process of expanding the international availability of their launch capability. They recently placed two Indian spacecraft into orbit and are reported to be discussing further launches with other non-Communist states. And, of course, the European Space Agency is develop-

ing the Ariane vehicle, a vehicle similar to the Atlas Centaur with its first test flight planned for later this year.

Even among the developing countries there is interest in the launch vehicle area. India is developing a small Scout-type launcher, and although the first test flight last month was unsuccessful, we expect India will pursue this program. Brazil is also planning to develop a launch vehicle, probably based on French technology.

In response to these competitive developments we must certainly give renewed priority, as this administration does, to advanced research and development aimed at assuring continuing U.S. technological and scientific leadership. In the last year, for instance, NASA has formally reentered the field of advanced communications technology research and development, consistent with one of the recommendations of the subcommittee's panel, I might note. NASA's efforts are emphasizing high technology approaches for more efficient frequency and orbit utilization, which we believe will be increasingly essential to U.S. industry in the coming decade.

The Space Shuttle, with its enhanced payload capability and mission flexibility, represents another significant step forward in retaining U.S. space leadership. In anticipation of the benefits of the Shuttle, a number of foreign users are designing satellites or planning Spacelab missions for flight on this new system in the early eighties. We have already received earnest money deposits from agencies in Canada, Germany, India, Indonesia, Intelsat, and the Arab Satellite Communications Organization for Space Shuttle launches, primarily for communications satellites, in the early eighties.

Mr. Chairman, in conclusion I would not want to leave you with the impression that this growing foreign competition is incompatible with expanding international space cooperation. Continuing dialog aimed at defining carefully structured cooperative efforts has a number of positive advantages, both to the United States and to our foreign counterparts. In addition to the benefits I mentioned earlier, it permits us to have some influence over the timing and direction of foreign program initiatives, and it also keeps us better informed as to foreign intentions and capabilities, making U.S. industry more effective competitors.

Thank you, Mr. Chairman.

Mr. BROWN. Thank you, Mr. Pedersen. That is a very helpful statement, and we appreciate the presentation.

In accordance with what I understand is the chairman's plans, I will ask the next member of the panel to present his statement, and we will proceed seriatim, and then question the panel at the conclusion. Mr. Terrell.

STATEMENT OF NORMAN TERRELL, DEPUTY ASSISTANT SECRETARY, OCEANS AND INTERNATIONAL ENVIRONMENT AND SCIENTIFIC AFFAIRS, DEPARTMENT OF STATE

Mr. TERRELL. Thank you, sir.

It is a pleasure for me to appear before the committee on behalf of the Department of State to discuss the very important topic of international space cooperation. This is an area of keen interest to the Department and one in which we work very closely with NASA and with the other agencies responsible for our space programs.

International participation has been a key element in the U.S. space program from the very beginning. In some areas, such as space communications, where our commitment to Intelsat is a prime example, space meteorology and launch services, well developed operational interchanges with foreign participants have been established. In the areas of space science and research and development satellites, the United States has also cooperated actively with a large number of other countries. Against this background of strong international interest in the U.S. program, key decisions will shortly be before us in the area of operational remote sensing from space. Issues of foreign participation in our own remote sensing program and the interaction between U.S. and foreign programs will be of high interest during the next few years.

There are several important reasons for the United States to seek international involvement in its space programs and to be responsible to international concerns in this area. First, international sharing in the benefits of space exploration and space applications has been a key factor in creating an international regime favorable to the U.S. space program. The international legal regime, represented by the 1967 Outer Space Treaty and the conventions on registration, liability, and return of astronauts is predicated on the widespread realization that the benefits derived from space accrue to the world as a whole and not just to the United States and other space powers. Although from time to time measures are introduced in the United Nations to alter this regime in a way that could limit our flexibility to carry out programs in our national interest, we have been successful in resisting such measures. A large part of this success derives from the significant stake that other countries have in Landsat, the U.S. meteorological satellite program, the U.S. space science program, and the development and operation of U.S. space launching vehicles.

A second area of importance to the United States is the sharing of the cost burden which international cooperative activities have brought about. A large part of the U.S. launcher program has been supported by reimbursable launches on behalf of foreign countries and international organizations. The meteorological satellite program has realized substantial benefits from foreign instruments contributed to U.S. spacecraft. The Landsat program, even in the research and development phase, has established the principle of cost sharing through the access fees paid by the operators of foreign ground stations—a principle which I believe we will see continued as the United States moves to an operational Earth resources system. The principle of large-scale cooperative projects with the cost borne by both sides is also well established in the U.S. space science program.

Third, U.S. industry has enjoyed a substantial market in the export of space-related equipment and services resulting to a substantial degree from the international cooperative space efforts of the United States. These have included large sales of satellites and satellite components, ground stations, launch vehicles, computers, and the associated services related to their operation and maintenance. These exports are largely governed by the provision of the International Traffic in Arms Regulations administered by the Department's Office of Munitions Control. In administering these regulations, the De-

partment of State is governed primarily by provisions of the International Security Assistance and Arms Export Control Act of 1976. We are mindful of the importance of timely and predictable licensing decisions to the competitive position of U.S. industry in the world market.

Finally, the space program has been strongly supportive of other U.S. international policies and programs. In the most general sense, these include the international prestige, influence and goodwill which the U.S. role in international space activities has brought about. More specific examples are the benefits to economic development resulting from our international Earth resources and space communications activities, the benefits to our worldwide meteorological program, and the strong support the U.S. remote sensing program has provided to the economically important area of world crop forecasting.

For the immediate future, I believe it is the Earth resources program which will command the greatest attention from the State Department and other agencies in terms of international policy formulation and implementation. As the committee is aware, the United States has announced its commitment to an operational Earth remote sensing system, the technical and management parameters of which are still in the process of definition. This commitment is of very great interest and importance to the international community. Large investments have been made and are being made in overseas facilities to receive, process and use the data from U.S. Earth resources satellites. By the mid-1980's, it is estimated that some 15 countries will have receiving facilities in operation and that their activities will encompass most of the Earth's land surface area. The announcement by President Carter that the United States will provide continuity of data services to domestic and international users throughout the 1980's was of great significance to the countries operating these foreign ground stations. The decisions still before us in implementing this commitment in concrete terms will be followed with keen interest by the international community. Particularly important will be the directions taken by the United States with respect to open data dissemination and direct foreign participation in the Earth remote sensing program—two elements which have contributed decisively to the widespread international acceptance of the U.S. meteorological satellite and experimental Landsat programs.

U.S. decisions on large-scale development projects, such as space power systems and large-scale space communications structures, are still in the future. But these prospects are already attracting considerable attention in the international community. As we move toward domestic decisions in these areas, it will be important to keep in mind the opportunities they may afford for international participation. In fact, as in many other expensive advanced R. & D. projects, financial participation by a large number of countries may be necessary to successfully realize large-scale space projects of this kind.

The United States will continue to pay close attention to space policy developments in the United Nations and elsewhere in the international community. I believe the committee would be particularly interested in two of these issues which are a perennial focus of the U.N. Outer Space Committee—the principles that will govern remote sensing from

space and the claim of some countries of sovereignty over that portion of the geostationary orbit to which they are subjacent. With regard to remote sensing principles, the United States has consistently supported the position that all nations have a free right to conduct Earth resources activities from space, that the sensed state does not have a right to regulate the data so acquired or analyzed information derived from that data, and that the data obtained from these activities should be given the widest practical dissemination. In our view, this position best supports the interests of sensing and sensed states alike and guarantees against abuses that might result from selective or discriminatory acquisition and dissemination of this economically and scientifically significant data. Some countries have suggested other regimes that would in one way or another restrict these activities, generally by giving some greater degree of control to the sensed state. However, we do not believe that this would result in increased benefits to the nations that use these data and we will continue our efforts to promote a liberal dissemination regime. On the issue of the geostationary orbit, the matter was legally settled in our view by the 1967 Outer Space Treaty, which provides that outer space—and that includes the geostationary orbit—is not subject to claims of sovereignty by any country. Proposals to the contrary are supported by a relatively small number of states and do not command widespread support among the general membership of the Outer Space Committee.

During the past year, the U.N. Outer Space Committee has decided to call for a U.N. Outer Space Conference to take place in 1982. The major thrust of U.S. planning for this conference will be to emphasize the benefits of outer space to all countries and the practical and technical aspects of achieving them. The U.S. position is that political and legal issues should be kept out of the conference and dealt with in the U.N. forums which have been set up for the process of debating and resolving them. There is a great deal of a practical nature that remains to be done in bringing the benefits of space technology to the less advanced countries and in bringing their needs and requirements into sharper focus in the national space programs of the United States and other advanced space countries. The U.N. Conference on Outer Space can do useful work in this direction.

An initiative taken by the United States in the just completed U.N. Conference on Science and Technology for Development will serve as an important bridge between that conference and the 1982 space conference. This initiative has two thrusts: Work with other operators of remote sensing systems and work with the countries which use remote sensing data. With those states that plan to operate remote sensing facilities, the United States will discuss areas where U.S. and foreign satellites may be made as compatible and complementary as possible so as to maximize the beneficial data available to users throughout the world. Some preliminary discussions have already taken place and we plan to work closely with NASA to intensify these activities in the coming months. For user states and international development assistance organizations, the United States feels it would be desirable for those countries actively engaged in satellie remote sensing to hold regional meetings in which prospects for increased use of satellite remote sensing in the 1980's can be fully explored. The United States would be willing to assist regional groups in setting up such meetings

which can facilitate a full exchange of views on current experiences and prospects for future use of satellite remote sensing. The results of these regional meetings could usefully be an input into the 1982 conference. The United States would also certainly want to take them into account as we plan our future remote sensing and development assistance programs.

That completes my prepared statement. I would be pleased to elaborate on any points in question.

Thank you.

Mr. BROWN. We will proceed with the other panelists.

Just for clarification, this last point that you made with regard to the United States assisting regional groups in setting up meetings on the remote sensing, isn't that essentially what our proposal was to the UNCSTD?

Mr. TERRELL. Yes, that was half of our proposal. The other is that those who operate and plan to operate remote sensing systems should get together to discuss ways of harmonizing their systems so that they will be compatible and work together so that we wouldn't have unnecessary space duplication and will get the most for our space dollars for all users.

Mr. BROWN. Thank you.

Can we proceed with Dr. Mountain.

STATEMENT OF MAURICE J. MOUNTAIN, DIRECTOR OF STRATEGIC TECHNOLOGY AND MUNITIONS CONTROL, OFFICE OF INTERNATIONAL SECURITY AFFAIRS, DEPARTMENT OF DEFENSE

Dr. MOUNTAIN. Thank you, Mr. Chairman.

I am happy to appear before this subcommittee to describe the role of the Department of Defense in international space matters. Specifically, I want to address the Defense view of the issue of the export of space technology and technology transfer raised in the November 1978 report by the Subcommittee's Panel on International Space Activities.

Under the provisions of section 38 of the Arms Export Control Act in furtherance of world peace and the security and foreign policy of the United States, the President is authorized to control the import and export of defense articles and defense services. By Executive Order 11958, the President delegated to the Secretary of State authority for controlling such exports including the authority to designate those items or categories of items which should be considered as defense articles or services. The Secretary of State, in exercising this authority is required to consult with appropriate agencies and with regard to the designation of items or categories of items to be controlled to obtain the concurrence of the Secretary of Defense.

As Mr. Terrell has pointed out, the Secretary of State administers these regulations under the international traffic and arms regulations, and with the concurrence of the Secretary of Defense, publishes a list of defense articles and services known as the munitions list. To export such items, a license must be obtained from the Department of State. As part of the consultation function required by the Executive order, about 15 percent of the applications, currently about 4,500 annually, are sent by State to Defense for review from the standpoint of their impact on our national security. A considerable num-

ber of these applications fall in the munitions list categories of "aircraft, spacecraft and associated equipment" or "military and space electronics".

The role of the Department of Defense in reviewing such cases is to assess their military significance and to recommend to the Department of State their approval, approval with conditions, or denial. Our central concern is whether equipment or technolgy exported for peaceful purposes subsequently become converted to military uses. Quite obviously this concern varies with the particular country involved. Transactions in which a diversion to military purposes would result only in increasing the strength of an ally, adding to free world defense, or promoting weapons standardization tend to find ready approval in Defense. On the other hand, where such diversion could increase the chance of hostilities, upset a regional balance of power, promote an arms race, risk the compromise of classified U.S. information, the loss of a significant technological advantage to the United States or the like, Defense necessarily takes a different view. In either case, we must face the fact that the potential for diversion is intrinsic to a great deal of space hardware and technology. To cite but one example, the launch vehicle to place a satellite in geostationary orbit for space purposes is not greatly different from that of a ballistic missile; the same technology builds them both. Similar statements can be made about certain guidance and control components, communications equipment and remote sensing devices.

When, therefore, items on the munitions list are to be exported in support of a space project the question Defense asks is: "To what extent is this equipment or technology likely to be diverted to a military purpose, either in the country of destination or through reexport to a third country, and how detrimental to our national security would such a diversion be?"

One test is whether the proposed export is appropriate to its stated purpose. If, for example, an item of hardware is far more sophisticated or has much more capacity than is needed to perform its space function but these characteristics would make it ideally suited for a military weapon system we would ask why. Moreover, unless in the answer there was some special justification for it, we would seek to have this excess capacity reduced to that which was actually needed to make the space project successful.

With exports involving only hardware, these determinations are not too difficult. In addition, in cooperative activities a diversion of equipment to other than its agreed purposes would, in all probability, be noted by us and this very fact would tend to deter any such diversion.

The case with technology is different. The diversion of one or more individual pieces of equipment is less important than the diversion of the know-how to design, develop and produce such items in quantity. This is the technology of concern to Defense. Once it has been transferred, it is essentially uncontrollable. It can be applied over and over again. The fact that it is initially utilized for its stated civil purpose is no guarantee that it may not later be used for military purposes. More importantly, there is no sure way to detect when

such a diversion has occurred or halt it should it occur. Technology once exported cannot be recalled.

In making its recommendations in these matters, the Department of Defense, while fully aware that a successful program of space cooperation is in the U.S. interest, must be concerned with the national security aspects of it. The resolution of the problem lies in some cases with the furnishing of hardware instead of technology or with limiting the scope of a proposed technology transfer to its less sensitive elements. In this way, the scientific and cost reduction goals of space projects can be maximized while minimizing the risks to our national security.

With this as a general outline, let me turn to certain questions which your panel's report raised. One was whether space items should be removed from the munitions list and placed on the commodity control list administered by the Department of Commerce.

The difference between the items on these two control lists is that those on the munitions list have military purposes although in some cases they may also have civil uses. The strategic items on the Commerce list are the reverse: although they may have important military uses, they are primarily civil items as for example, a large general purpose computer or machine tool or something of that kind.

Our difficulty is that we have simply not had enough experience with space componentry to be able to say with confidence that items now on the munitions list, such as launch vehicles, have greater civil than military uses. When we can make that determination, shifts from one list to the other can be recommended. However, it should be noted that such a shift will not reduce the need for U.S. firms to obtain export licenses; it will mean only that they will then have to get their license from Commerce rather than State. Whether this would speed the processing of applications may be doubted. Certainly it would increase the number of agencies to be consulted because in the normal kind of munitions process only State and Defense are involved and aware.

A second question raised by the report is whether present procedures call for exports to be dealt with on a cumbersome case-by-case basis. This is not so in a number of important instances. Where a program will continue over an extended period of time with a great many exports to be made, and this certainly is characteristic of space projects, State can and does grant what amounts to general licenses by approving technical assistance agreements. Under this arrangement, American exporters are authorized to transfer technology as described in the agreement on a continuing basis for the life of the agreement which may be anything from 6 months to 5 years. Once the basic license is issued, the U.S. contractor no longer has to seek authority on a case-by-case basis for individual exports. Instead, as he ships his goods or services, he merely certifies in a U.S. customs declaration that the shipment is being made under and conforms to the conditions and whatever limitations there are in the basic license.

Sometimes such licenses are issued pursuant to a government-to-government agreement or memorandum of understanding in whose formulation State and Defense have participated. In any event, the result of this arrangement is that the risks and benefits to the United States—diplomatic, economic, and military—can be determined at the outset on something of a one-time basis and the level and kind of tech-

nology transfer which is in the U.S. national interest is determined for the whole project instead of having to make such a determination afresh with each export transaction.

Because we already have such a system in operation and it has shown itself highly adaptable, Defense would suggest that whatever changes may be needed should take the form of improving our existing arrangement rather than shifting jurisdiction from the munitions list to the commodity control list.

Mr. Chairman, I believe I have outlined the role of the Department of Defense in this area. I shall be glad to answer any further questions you may have.

Mr. FLIPPO. Thank you very much.

[The prepared statement of Mr. Knowles is as follows:]

STATEMENT OF KENT KNOWLES, DIRECTOR, OFFICE OF EXPORT ADMINISTRATION, DAPARTMENT OF COMMERCE, BEFORE THE SUBCOMMITTEE ON SPACE SCIENCE & APPLICATIONS OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY ON SEPTEMBER 6, 1979

BACKGROUND INFORMATION ON THE EXPORT CONTROL SYSTEM

THE EXPORT ADMINISTRATION ACT

The Department of Commerce administers the Export Administration Act of 1969, as amended, under delegation from the President. Within the Department, the Office of Export Administration (OEA) in the Bureau of Trade Regulation is the organizational unit charged with the day-to-day administration of the Act and the regulations promulgated under it.

The Act calls for the control of exports to the extent necessary (1) to guard against the export of items and technology which may contribute significantly to the military capabilities of potential adversaries and thereby damage the national security of the United States, (2) to further significantly the foreign policy of the United States and to fulfill its international responsibilities, and (3) to protect the domestic economy of the United States from the excessive drain of scarce materials and to reduce the inflationary impact of foreign demand.

Items whose export is under the jurisdiction of the Commerce Department appear on the Commodity Control List (CCL). These items are so-called "dual-use" items, i.e., they have both civilian and significant military applications. Items considered to be of primarily military significance are listed on the U.S. Munitions List, which is administered by the State Department, and certain nuclear related items fall under the jurisdiction of the Nuclear Regulatory Commission.

Export controls administered by Commerce cover not only direct exports of commodities and technical data from the U.S. but also reexports of those commodities and data to third countries, as well as the use of U.S. technical data abroad and the use of U.S.-origin parts and components in commodities manufactured abroad and destined for a third country.

However, not all of the items under Commerce jurisdiction require specific licenses. Approximately 90 percent of all exports from the United States are shipped under the authority of a "general license" which allows the exporter to ship freely to all but embargoed destinations (Cuba, Vietnam, Cambodia, North Korea and Southern Rhodesia) without applying to the Commerce Department for a specific "validated" license. Commodities that do not qualify for a general license, and are therefore under validated licensing control include:

Products having significant military applications and therefore subject to multilateral controls by COCOM, the group of 14 countries composed of the NATO nations, minus Iceland, plus Japan, which coordinate their export controls.

Certain items which the U.S. controls unilaterally either because they are considered to be extremely sensitive or because they are uniquely available in the U.S.

Petroleum and related products that are under control for short supply reasons.

Certain commodities which are controlled for foreign policy reasons: items related to nuclear weapons and explosive devices, nuclear facilities, and crime control and detection equipment.

Technical data relating to the design, production or use of these commodities are also under licensing control by Commerce. The transfer of technical data is in many instances of greater strategic significance than the export of finished items produced from that technology. We can limit the amount of manufactured items that are exported and to a useful extent control their use in communist countries. But if we were to allow the unrestricted export of design, production, testing and maintenance data, we would thereby permit the recipient country to acquire the capability of making the end product in question for itself. That would effectively remove our ability to exercise any control over these products' quantity and end-use. For this reason, the Department exercises broader controls over the export of U.S.-origin technical data to communist countries than we do over the shipment of finished products to these destinations.

With this as a general background, let me describe briefly our licensing process, including consultation with our advisory agencies and with industry in general.

THE LICENSING PROCESS

On the average, OEA receives approximately 280 applications for validated licenses daily. An incoming application is numbered and examined to see that it is complete. The names of the parties to the transaction are checked against a list that includes known or suspected diverters of strategic goods. The application is then sent to a commodity technician in one of OEA's commodity licensing divisions. There are three such divisions: the Computer Division, the Electronics Division, and the Capital Goods and Production Materials Division.

The technician reviews the application on the basis of several factors: the equipment's function and uses, its level of sophistication, the normal pattern of its military or civilian uses in the U.S. and in the country of destination, the degree to which comparable equipment is unrestrictedly available elsewhere, the equipment's suitability for the proposed end-use, the end-user's known activities, the likelihood that the equipment might be diverted from the stated end-use to less acceptable uses, and the economic/commercial implications of the transaction for the U.S.

A limited number of cases involving communist countries are decided at this point in the licensing division. For most cases, however, the technician documents his analysis of the application and forwards it with the application to the Policy Planning Division (PPD) which determines the extent of further review required.

PPD may act upon an application on the basis of agreed interagency guidelines. Alternatively, it may refer the case to one or more advisory agencies for their individual comments and recommendations. It may also have the case discussed formally in an interagency committee, depending on the degree of concern the agencies have over export of the particular equipment. The case moves to a higher level only when there is disagreement among agencies at the senior staff level.

If Commerce and its advisory agencies agree in the course of the licensing process that a transaction involving an item or technology that is subject to control by COCOM merits approval, details of the proposed transaction must in most cases be submitted to COCOM and the concurrence of the 14 other COCOM member governments sought. Only after unanimous agreement in COCOM is the application approved for licensing.

In the event an application is rejected, the applicant has the right to appeal to the Assistant Secretary for Industry and Trade. Less than 1 percent of all cases received in 1978 were rejected.

INTERAGENCY CONSULTATION

On October 29, 1974, the Export Administration Act was amended and a new Section 4(h) mandated a Defense Department review of export license applications for all communist countries, including Yugoslavia. This amendment authorized the Secretary of Defense to determine the types and categories of transactions to be reviewed. During the early part of 1975, the Defense Department reaffirmed the majority of the previously agreed delegations of authority under which the Department of Commerce was authorized to act on certain

types of license applications without individual Defense Department review. More recently, a similar delegation of authority relative to computers was updated and broadened. Additional delegations are currently under consideration. Cases not covered by such delegations of authority are sent to Defense for review on a case-by-case basis. In 1978, 1783 applications were formally referred to the Department of Defense under Section 4(h). In the first half of 1979, these have been running at a yearly rate of 1980.

In addition to our informal, day-to-day consultations with other agencies, we consult them and formally through a system of interagency committees at different administrative levels. At the senior staff level, there is the Operating Committee which is chaired by Commerce and meets weekly to discuss export control policy problems and significant individual transactions. Commerce, Defense, State, Energy, Treasury, the National Aeronautics and Space Administration, the National Security Council and the Arms Control and Disarmament Agency are regular members; the CIA is a regular advisor.

Interagency policy differences that cannot be resolved by the Operating Committee are referred to the sub-ACEP (Advisory Committee on Export Policy) which meets at the Deputy Assistant Secretary level, and if necessary to the ACEP, which meets at the Assistant Secretary level. Differences which cannot be resolved at or below the ACEP level are referred to the Export Administration Review Board (EARB), consisting of the Secretary of Commerce as chairman, the Secretaries of State and Defense, and as of March 1, 1976, the Secretary of the Treasury in his capacity as the chairman of the East-West Foreign Trade Board. Other concerned Cabinet members are included in the EARB's deliberations as appropriate. Highly sensitive problems may ultimately be referred to the White House for final resolution.

All applications to export dual-use commodities and technical data to communist countries are processed by the Commerce Department in accordance with procedures established in consultation with our advisory agencies. Originally, when the level of trade with the East was very low and export controls were much more extensive, other agencies would be consulted formally through the interagency committee structure on *each* application. Over the years, however, the rising volume of East-West trade has resulted in a yearly case volume of thousands of applications and has made it neither possible nor advisable to give each one full-fledged interagency consideration. Therefore we and our advisors have established guidelines for approving or rejecting applications to export a vide variety of commodities without the necessity of seeking specific interagency advice on each proposed transaction. In 1977, OEA acted on 3,097 out of a total of 4,582 communist country cases under such guidelines.

Documenting and analyzing applications that require review by the Operating Committee constitutes a heavy workload. As a minimum, the Operating Committee documentation includes the following:

A technical description of the commodities or data involved and their intended end-use;

An evaluation of the proposed transaction's strategic significance;

Information on the foreign availability of comparable commodities or data;

The licensing history of past applications for similar commodities or data; and

A recommendaton for approval or denial together with the rationale supporting the recommendation.

Preparing this documentation requires care and can be time-consuming. The facts may be hard to establish. It is often necessary to consult sources in the export trade or in other parts of the government on technical aspects of the cases. The documentation for computer cases, for example, must include pages of detailed technical specifications and schematics of the proposed system so that technicians in the other agencies can fully comprehend the recommendation.

The review process may reveal that a computer system, as proposed for export by the applicant, raises serious strategic concerns which could be allayed if certain modifications were made to the system. In such instances, the applicant is consulted to see if the modifications would be acceptable to him and still meet his customer's needs. This enquiry may take time inasmuch the applicant often must communicate with his customer through his overseas sales force.

Once the documentation on any given transaction is completed, the case is brought up for discussion in the Operating Committee. The Committee's advice and the chairman's recommendations are forwarded to the Director, OEA, for his decision or, in some instances, for referral to the Director of the Bureau of Trade Regulation. If any agency objects to the proposed decision, it is given full

opportunity to appeal to a higher level. During 1978, 694 transactions were submitted to the Operating Committee for formal review; in the first half of 1979, these have been running at a yearly rate of 914.

Many of the applications that do not require formal Operating Committee review still must be referred to one or more advisory agencies for advice, usually the Department of Defense, but sometimes State, Energy, NASA or CIA. While the documentation required for these referrals is not as extensive as for an application that must be formally reviewed by the Operating Committee, there still must be a memorandum setting forth the details of the transaction, the policy considerations involved, previous approvals, end-use and end-user information and extensive technical information. If an advisory agency has problems with the transaction, it can request formal review by the Operating Committee.

COCOM

COCOM is an informal, voluntary multinational organization formed in 1949 to control exports of strategic commodities from member countries to communist countries. The membership consists of the NATO countries, minus Iceland, plus Japan. Although the membership is closely parallel to that of NATO, COCOM is an independent organization. Furthermore, unlike NATO, it is not a treaty organization.

The COCOM embargo list consists of commodities whose export to the East all member countries have agreed should be prevented. Each country, however, may unilaterally control additional items if it wishes. Items on the COCOM embargo list may be exported to Communist countries if a COCOM member requests that an exception be made to the embargo for that transaction and if all the other members unanimously agree to the export.

Because the U.S. Commodity Control List (except for a small number of items which the U.S. controls unilaterally) is identical to the COCOM embargo list, COCOM approval must be sought for a large portion of U.S. applications that we decide should be approved. The request for an exception to the embargo is sent to the U.S. delegate to COCOM. The information the delegate receives is transcribed into COCOM format, translated into French and distributed to the other delegates who are given time to submit the proposal to their governments and to review the presentation before a discussion is scheduled. If no questions are raised by the other delegates, it commonly takes about four weeks before OEA is informed that a license can be issued. Occasionally, however, one or more of the participating country delegates will raise questions or objections to a proposed export. These must then be transmitted to OEA, answers must be prepared and sent back to Paris and another COCOM discussion scheduled. In such circumstances, months may pass before agreement is reached and the license issued.

The COCOM embargo list is periodically reviewed and updated. Any changes to the list require the unanimous consent of all members. Such a review began in the Fall of 1978 and will continue through 1979. The Department of State is responsible for formulating the U.S. position in these negotiations, which take place in Paris. It also has lead in the conduct of the U.S. participation in the negotiations. All concerned agencies, however, participate in all phases of the list review.

CONSULTATION WITH INDUSTRY

The Department consults extensively with industry in the course of the control and licensing process. In the day-to-day process of analyzing applications, OEA consults individual firms informally both on technical matters and on the foreign availability of commodities under licensing control. There is also a formal structure for such consultation in the form of six government-industry Technical Advisory Committees (TACs) established pursuant to the 1972 amendments to the Export Administration Act. The TACs meet regularly to discuss numerous aspects of export control policy and practice. TAC members have been cleared for access to classified information so that they can make a maximum contribution. The industry members were chosen for their technical knowledge from firms, large and small, that are affected by our controls but the industry members serve as individuals, not as company representatives.

By their charters, the TACs serve strictly in an advisory capacity to the Department. Their reports receive the most serious consideration, but the final judgment on the issues is and must be reserved to the government. The TACs have been extremely active in providing advice with respect to our preparations

for the COCOM list review now in progress. A number of the TACs submitted reports containing recommendations respecting control levels. Although the government could not in every instance agree with the TAC's assessments of national security implications of various control levels, their technical evaluations and findings respecting foreign availability were in many instances very useful in the formulation of the U.S. position in the COCOM negotiations.

LICENSING CRITERIA

In the licensing process, we focus primarily on the national security implications of a proposed export but we also consider such factors as foreign availability and economic benefits to the U.S. The Export Administration Act requires us to use export controls both to encourage trade and to restrict the export of goods and technology which would "make a significant contribution to the military potential of any other nation or nations which would prove detrimental to the national security of the United States".

In considering export applications for non-communist destinations, our chief concern is whether or not the commodity is likely to be diverted to a proscribed destination. Before we approve the export, we consider the known reliability of the consignee, the use to which he intends to put the equipment, and the appropriateness of the equipment for that use.

In reviewing applications for communist destinations, however, we consider a wide range of questions, such as:

a. What is the item's normal use in the U.S. and elsewhere in the West? Is the item designed for military purposes or does it have significant military uses either in the West or in the country for which it is destined?

b. If the item has both military and civilian uses, is the intended end-use peaceful in nature?

c. Is the prospective end-user engaged in civilian or military-oriented work?

d. Does the item incorporate advanced or unique technology of strategic significance that could be extracted?

e. Does the proposed recipient country have a shortage of the item that affects that country's military potential?

f. Are comparable items or technical data readily available from suppliers outside the U.S.?

g. Would the export have significant economic benefits for the U.S.?

In determining the impact of a proposed export on the military capability of a communist country, we rely strongly on the Department of Defense to supplement our own analysis. Defense's technical and intelligence specialists analyze the recipient country's military needs and capabilities and assess the likelihood that the equipment or technology might be diverted to military uses. They also assess the effect such diversion might have on our national security. Defense also makes its own assessment of the proposed end-user's activities.

The next important factor that we consider is the degree to which comparable products or data are available either in the communist countries themselves or from Free World countries that are not members of COCOM, for example, Switzerland and Sweden. (We assume that a product subject to COCOM controls that is available only from a COCOM member is not freely available to a communist purchaser.) Sometimes an applicant for an export license will claim that a product comparable to his is readily available from a foreign competitor. He may even provide brochures to support his contention. But often, closer examination will reveal that the product is not really comparable in quality or that the supplier's production capabilities are inadequate, or that the production lead time from the non-COCOM source is so long as to render the item effectively unavailable. Where we do find that fully comparable products are readily available to a communist country in the necessary quantities, this not only affects the licensing decision on the specific application at hand but also plays an important role in determining whether the product should continue to be controlled or not.

It is extremely difficult to obtain precise information on availability from communist sources of high technology products and know-how. But we do get some. Our Technology Advisory Committees often provide valuable information obtained through commercial channels on products manufactured in communist countries. The CIA, in its advisory capacity to the Department, provides what information it can. In general, however, we must start from the premise that the Soviets will not spend hard currency for something they already have, unless what they want is significantly better than what they have, is available in larger quantities or at an earlier date.

Economic and foreign policy considerations grow in importance as strategic and foreign availability considerations diminish. We attempt to evaluate any large transaction's significance to the domestic economy and to make our advisory agencies aware of the economic potential of such exports so they will consider them in making their recommendations.

It is important to note that national security export controls will not *prevent* the communist countries from developing certain military capabilities; given enough time, they obviously have the skill and resources to make significant advances on their own. The real effect of national security export controls is substnatially to *slow* the development of communist military capabilities.

CONTROLS OVER TECHNICAL DATA

The Commerce Department exercises broader controls over export of technical data to communist countries than we do over the shipment of commodities to these destinations.

In our regulations, we define technical data as information of any kind that can be used, or adapted for use in the design, production, manufacture, utilization or reconstruction of articles or materials. The data may take a tangible form such as a model, prototype, blueprint or an operating manual, or they may take an intangible form such as technical service.

Our regulations define an *export* of technical data as (a) any actual shipment or transmission of technical data out of the United States, (b) any release of technical data in the United States with the knowledge or intent that the data will be shipped or transmitted from the United States to a foreign country or (c) any release of technical data of U.S. origin in a foreign country. Our regulations define the *reexport* of technical data as any actual shipment or transmission from one foreign country to another, or any release of technical data of U.S. origin in a foreign country with the knowledge or intent that the data will be shipped or transmitted to another foreign country.

The phrase "release of technical data" is defined in our regulations as (a) visual inspection by foreign nationals of U.S. origin equipment and facilities located either in the United States or abroad, (b) oral exchanges of information in the United States or abroad and (c) the application to situations abroad of personal knowledge or technical experience acquired in the United States.

The Department permits some technical data to be exported under general license—that is, without the exporter's having to file an application and receive specific written authorization prior to shipment. One general license, designated GTDA, permits the export and reexport to all destinations of technical data that are (a) generally available to the public, (b) scientific or educational data, or (c) contained in certain applications for patents.

Our regulations define data generally available to the public to include (a) data released orally or visually at open conferences, lectures, trade shows, or other media open to the public, and (b) publications that may be purchased without restriction at a nominal cost or obtained without cost, or are readily available at libraries open to the public.

In the scientific or educational sphere, our general license GTDA applies to the dissemination of information not directly and significantly related to design, production or utilization in industrial processes, including such dissemination by correspondence, attendance at, or partcipation in, meetings, and to instructions in academic institutions and academic laboratories, excluding information that involves research under contract related directly and significantly to design, production or utilization in industrial processes.

In addition to data that may be exported under general license GTDA, our regulations permit certain other types of data to be exported to the USSR, the communist countries of Eastern Europe, Laos and the People's Republic of China under another general license, designated GTDR. However, these data are specifically defined in the regulations as pertaining to that information necessary to the assembly, installation, maintenance, repair or operations of a commodity that has been licensed for export and sent within one year following shipment of the commodity or to information necessary to support a prospective or actual quotation, bid or offer to sell, lease, or otherwise supply any commodity, plant, service or technical data. Specifically excluded are data related to the production, manufacture or construction of the commodity. In the case of qoutation data, our regulations also specfiically exclude data related to commodities judged to be strategic by the countries participating in COCOM and to commodities under the licensing jurisdiction of the Department of State and the Nuclear Regulatory Commission.

This general license GTDR also authorizes exports and reexports of most data not eligible for shipment under general license GTDA if intended for other than the communist or embargo destinations mentioned previously. There is, however, a requirement to obtain the prior approval of the Department for the export or reexport of data relating to certain commodities that are listed in the regulations. Data relating to certain other commodities, which also are listed in the regulations, may be shipped only after the exporter has received letters of assurance from the recipient undertaking not to reexport the data or to export the direct product of the data to certain destinations.

To summarize our technical data regulations, I believe I can say that they effectively control the export to communist destinations of all unpublished data that could be used to produce any commodity under our licensing jurisdiction. Through the written assurance provisions, the regulations also effectively restrict the supply to communist destinations of strategic commodities produced abroad through the use of U.S. origin technical data.

STATEMENT OF KENT KNOWLES, DIRECTOR OF OFFICE OF EXPORT ADMINISTRATION, DEPARTMENT OF COMMERCE

Mr. KNOWLES. Thank you, Mr. Chairman.

I would ask, if I may, permission to give a short oral statement and present the longer statement for the record.

Mr. FLIPPO. Without objection it is so ordered.

Mr. KNOWLES. I am pleased to appear before the Subcommittee on Space Science and Applications of the House Committee on Science and Technology to describe the national security export control system administered by the Department of Commerce and to discuss the Department's role in space matters in particular. I have submitted for the record a lengthy and detailed description of our national security export controls. In my remarks here, I shall give only a general outline of this system before going on to the specific subject of space matters and Commerce's role in that area.

Under the authority of the Export Administration Act of 1969, as amended, the Commerce Department exercises control over the export of so-called dual-use items. These are items having both civilian and significant potential military applications. As my colleague from Defense explained, we are talking here about items which have a mainly civilian use as opposed to a mainly military use.

The Export Administration Act directs that the export of dual-use items and of technical data shall be controlled for three reasons:

(1) To protect the U.S. national security;

(2) To further significantly the foreign policy of the United States; and

(3) To protect the U.S. domestic economy from the excessive drain of scarce materials and to reduce the inflationary impact of foreign demand.

Dual-use items whose export comes under Commerce's jurisdiction appear on the Commodity Control List, or CCL. Most items which are either regarded as having only military applications or which are specifically designed for military use appear on the U.S. Munitions List which, as has been said, is administered by the State Department.

Only a small portion of U.S. exports require the issuance of a specific validated license document by the Commerce Department. The large majority of exports are shipped under general license authority which allows the exporter to ship freely without applying for such a validated license. The commodities that do require a validated license, and which appear on the CCL, fall into three general categories:

(1) Those products judged to have the potential of contributing significantly to the military capabilities of potential adversaries. Most of these items are controlled multilaterally by an informal international organization called COCOM, composed of the NATO nations, minus Iceland, plus Japan. A small group of approximately 38 items is controlled unilaterally by the United States because they are considered particularly sensitive or because they are uniquely available in the United States.

(2) Certain items which are controlled for foreign policy reasons; for example, nuclear-related devices and facilities and crime control and detection equipment.

(3) Petroleum and related products that are controlled for short supply reasons.

Within the Commerce Department, the Office of Export Administration is responsible for processing applications for the export of items on the Commodity Control List and the technical data associated with them. This represents a large and steadily growing workload, currently running at a rate of 280 incoming applications per day, up from 225 per day a year ago, and promising to increase yet further. Moreover, the workload is growing not only in volume but in complexity as well. The nature of incoming applications clearly reflects the fact that the composition of U.S. exports appears to be shifting increasingly into high technology areas; incoming applications are involving steadily more complex systems and technologies which require steadily more sophisticated technical analysis by both Commerce and its advisory agencies and raise ever more difficult export policy issues.

Let me describe briefly the process that an application for the export of an item controlled for national security purposes goes through after its arrival in OEA. First, it is checked for completeness and logged in by the Operations Division. Then, applications to export to non-Communist destinations are examined to identify those of a sufficiently routine nature to enable them to be approved and licensed immediately without further review.

Incidentally, we get by far the great majority of licenses out within a 2-week period.

Applications for Communist destinations and those of a nonroutine nature to the non-Communist world are forwarded for review and analysis by a licensing specialist in one of OEA's three commodity licensing divisions: The Computer Division, the Electronic Equipment Division, or the Capital Goods and Production Materials Division.

The licensing specialist examines the application in the light of the following concerns: The equipment's uses and functions; its level of sophistication; its normal pattern of military or civilian use in the United States and elsewhere; the degree to which similar equipment is freely available elsewhere; the equipment's suitability for the proposed end use, the end user's known activities; the possibility that the item might be diverted from the stated end use to less acceptable uses; and the economic implications of the transaction for the United States.

The Commerce licensing specialist often at this stage consults on an informal basis with experts from other agencies while he is making his analysis.

A small number of cases which closely resemble cases decided in the past may be decided at this stage. The great majority of this batch of cases, however, are then forwarded, along with the licensing specialist's analysis and recommendations, to OEA's Policy Planning Division, PPD. Here, the application can follow one of three paths:

First, PPD may decide it on the basis of agreed-upon delegations of authority from other agencies, particularly Defense and State, who are the prime advisers on anything in the space area.

Alternatively, it may be referred to one or more advisory agencies, usually Defense, State, Energy, and/or NASA, for their review and recommendations which PPD will very carefully consider in its license review.

Third, PPD may decide that the case raises such complex technical and/or policy issues that it requires full-fledged interagency consideration at the senior staff level in the Interagency Operating Committee, which is basically composed of Commerce's advisory agency in the Federal Government.

If the case is referred to the Operating Committee and if it proves impossible to reach agreement in that forum, the case may be successively escalated to the Deputy Assistant Secretary level in the sub-ACEP, or Advisory Committee on Export Policy, to the Assistant Secretary level in the ACEP and, if need be, to the Cabinet level in the EARB or Export Administration Review Board. There is even provision for direct escalation to the President should all other forums prove unsuccessful in reaching agreement.

With the exception of the small group of about 38 items that the U.S. controls unilaterally, all of the items on the Commodity Control List which are controlled for national security purposes are also controlled by COCOM. Thus, if the United States decides in favor of approving an application to export to a Communist country an item subject to the COCOM embargo, it must obtain the approval of the other COCOM members as well after the Interagency Committee has unanimously approved it. The United States would send a request for an exception to the embargo, together with its reasons for recommending approval of the transaction, to COCOM headquarters in Paris. Only after unanimous agreement has been reached in COCOM on the case may the application be approved by the United States.

If an application is rejected by OEA, the applicant may appeal to the Assistant Secretary for Industry and Trade. Less than 1 percent of all incoming applications were appealed in 1978, however.

That is very brief sketch of the licensing process. My statement for the record goes into a great deal more detail.

Let me go on to address the specific topic of these hearings by outlining the Commerce role in space matters.

Commerce plays a rather minor role in the export of space systems and satellites. Most of the items involved are listed on the U.S. Munitions List which, as Dr. Mountain indicated, is under the jurisdiction of the State Department. Commerce has jurisdiction only over the ground portions of specifically civilian communications and navigations systems. Such components mainly of earth stations, are covered by the Commodity Control List and applications for their

export are subject to the same licensing procedures that I have just described.

Again, as Dr. Mountain indicated, on several occasions in the past, there have been proposals to widen Commerce's jurisdiction in this field to cover commercial communications satellites that are presently listed on the U.S. Munitions List. Each time such proposals have been made, however, they have been rejected after considerable debate and analysis, in large part because of opposition by the Defense Department. Defense understandably takes a close interest in all such exports because of their extensive potential military applications. Items listed on the munitions list require a license for both the equipment and the technical data before they may be exported to any destination, and their export to Communist destinations is prohibited.

If jurisdiction over these items were nevertheless moved from State to Commerce I would have to note that it would create further severe resource problems for OEA without significantly expediting or altering the manner in which such exports are presently processed. Given the extreme military sensitivity of such items and related technologies, Commerce would be as scrupulous in consulting the Defense Department, the NRC and NASA as State now is.

While we can also issue project licenses, the analysis is not much less than it would be on an individual basis, because we have to receive and analyze basically the same information.

OEA's worked is right now straining our manpower resources to the breaking point. The addition to this workload of a new group of cases that would be extremely complex even if not necessarily numerous, would only exacerbate that problem. If the decision were made to transfer this responsibility to Commerce, it would then be essential also to allow Commerce to increase its staff in order to cope effectively with the additional caseload.

Let me stress my belief, however, that administrative and procedural proposals intended to speed the licensing of space systems are unlikely to succeed—because they misread the nature of the problem. If it takes a long time to reach agreement on such exports, it is only in small part because of the procedures involved. The difficulty arises from the sensitivity of the items and technologies involved. Regardless of the procedures employed, or who is tasked with the licensing, strong differences of opinion will inevitably arise over proposals to export systems having such extreme military sensitivity. OEA deals with this problem continually in connection with applications to export advanced computers or electronic systems. The technology is so sophisticated that highly trained technicians can disagree as to its full ramifications and potential. Settling such technical issues is difficult and time-consuming. But even when the technical questions are settled to the satisfaction of all parties, the policy issues raised by a proposal to export such advanced systems or technologies can be very difficult to resolve and lead to protracted disagreement and debate. These are difficult questions involving vital matters of national security and foreign policy, on which serious individuals with responsibilities in those areas can and do disagree. The questions are not such that they can be settled by procedural changes.

Thank you for the opportunity of appearing here. I shall be happy to answer any question you may have.

Mr. FLIPPO. Thank you very much.

I will just ask the panel in general, and anyone that would care to respond please feel free to do so.

I would like to know if you could elaborate just briefly on the interactions of each of your agencies making these technology export decisions. Do you feel you have good communications, do you feel the licensing procedure is adequate or excessive, or could use some scrutiny for streamlining? I will just throw that out and anyone that would care to, may respond.

Mr. KNOWLES. I will take an initial crack at answering and let everybody contradict me as we go on.

Being relatively new in the job myself, I think one of the prime tasks I have and intend to take on is to do what I can to work with our advisory agencies to expedite and streamline the licensing process. I think we now have relatively good communication, but also think it can be improved, and we intend to work at that. I think we do consult effectively now, but we will try to do better. I will leave further comments to somebody else.

Mr. PEDERSEN. Mr. Chairman, I would note that NASA's role in this process is essentially an advisory one to both the State Department and Commerce, whatever space-related hardware and know-how is involved.

We feel that communications, at this point, are quite good. We are consulted on cases where we feel there is a need for our view to be heard. My office, in particular, has the responsibility within NASA to then spread that out so that the various technical organizations within NASA have an opportunity to comment. We then feed NASA's views back into the expert control process. And we have found historically, Mr. Chairman, that where we have a question or concern, that concern is listened to and heard. I would just note, however, that we are talking about commercial exports.

In NASA's own cooperative programs, as I noted in my statement, those are carefully structured so that little or no technology transfer is involved. They are developed in such a way that the cooperative partners fund and carry out their own responsibilities.

I think it is an important concern to keep in mind. But in general, we think the process is working rather well. We would all like it to go faster, I am sure.

Mr. FLIPPO. Mr. Terrell.

Mr. TERRELL. I think that I would agree with what my colleague from the Commerce Department said about the general effectiveness of the process. I would like to underline a point he made rather than repeat en masse everything that has been said.

The communication among the agencies is so good that I think that it is an almost ideal vehicle for bringing to the surface differences in policy emphasis. And I believe that the frustration that is sometimes expressed by the people who deal with this process, firms, foreign countries, is a reflection of that. And I don't believe that it is undesirable that this happens. I think that there can be genuine conflicts between the legitimate objectives of achieving the maximum amount of space cooperation, achieving the maximum of sales for our industries, protecting our foreign policy interests, protecting our national security interests. And these interests tend to be represented by different people and they tend to become bureaucratic squabbles. And it is

in the resolution of these that you get the best result. I wouldn't care to see any streamlining of the process that tended to submerge differences like that. If streamlining is intended to solve them faster, that is fine. And I think as long as we are dealing in areas that are as sensitive as the ones that the committee is addressing, we are going to inevitably run into snags and take a little time on them sometimes.

Mr. FLIPPO. The distinguished gentleman from California.

Mr. BROWN. Thank you, Mr. Chairman.

Gentlemen, this is an area of intense interest to all the members of the committee. We have had some very interesting testimony with regard to the problems which we face today and over the next decade or so in this area. I don't think anyone has come up with any schemes that seem to provide us with all the answers that we would like to have. I am generally quite impressed with the fact that in our space programs we do have a large element of international cooperation that seems to be working fairly well. But it is working well within certain limits.

I think the question may be as to whether those limits are too restrictive, or not restrictive enough, possibly, or whether there are other modes of operation that would be more successful.

For example, we had some discussion yesterday with regard to future problems in this area, which led to the point that possibly the institutional problems are more significant and more of a barrier than the technological problems in the future space development and international cooperation in space. I am glad to think of our experience in the communications field with the creation of Comsat and Intelsat as modes of operation in the communications field.

In effect, we have said that we have reached a point where commercial participation, and private participation by the business sector, is feasible, and we have created a mode of organization which accommodates that. I would like to raise the question as to what might be the next area in which we might logically follow that model.

For example, if we move into a system of large space platforms in geostationary orbit, multipurpose platforms, would it be feasible to consider a Comsat or Intelsat type of organization in which we would not only be cooperating in R. & D. with other developed nations, but in which we would be subjecting the entire operation to sort of a global centralized planning direction and control with full participation of all nations in the program as we do with Intelsat, which seems to me to be an extremely reasonable type of operation. Could I ask you to comment with regard to that possibility?

Mr. TERRELL. I will be glad to if you wish.

Mr. BROWN. Because I think it helps to resolve some of these other problems that we are talking about also.

Mr. TERRELL. Let me just say I agree with you. I think that if we do get to the point of planning for large space platforms in geostationary orbit for communications purposes, that is an almost ideal technology to apply the Intelsat model to. And I would visualize that that might happen very naturally. Obviously we are quite a ways from that. We are quite a ways from the national decisions to fund our share of something like that. I think that is a very good example of the kind of thing we are going to see both in the space area and other high technology areas in the years to come, and that is projects which are of such size and scope and cost so much money that it is going to be increasingly

difficult for countries to take them on as national efforts. And we are going to have to use more imagination in getting more countries involved than we have been.

Mr. FLIPPO. Will the gentleman yield?

Mr. BROWN. I will yield.

Mr. FLIPPO. What has been done to advance those components that you are talking about, institutions that can accomplish these things Mr. Brown has been talking about?

Mr. BROWN. We might note that the chairman of the full committee has jumped the gun on his proposal for a space industrial corporation, Of course I regard these as aspects of space industrialization. They are the projecting of normal commercial business and industrial service and production activities into a space environment. They are part of the same basic picture that we are talking about. I am not sure whether space industrialization is going to come before the commercialization of space communication that we are discussing.

The question is what and where is the planning being done with regard to models of this sort of activity?

Mr. PEDERSEN. Let me try answering that, perhaps in a little too indirect fashion. But taking the case, for example, of large space structures, experience seems to have demonstrated that it is very difficult to begin to get concrete planning of international institutions until the various countries have gone far enough in their own thinking to determine whether or not it is in their national interests to allow this to be internationalized.

In the case of large space structures, I sense now that most countries are in a period of what we might call individualized planning and thinking. We have, as this subcommittee perhaps knows, had some contacts with the Germans, who have expressed an interest in large space structures and have some ideas in these areas. But one gets the feeling that countries are looking at this now and perceiving what might be their national interest, and determining how far that national interest will allow them to go at this time in thinking of international solutions to these problems.

I think until each country, including this one, has thought through the concept of large space structures and how it relates to their own particular objectives in space, it is going to be difficult to get that kind of international consensus that rightly or wrongly seems to be necessary before one could begin talking.

The case of Comsat-Intelsat is a good one. That really developed after communications satellite technology was proven, was near operational, or was operational. We are a long way from that in large-scale space structures. We are perhaps somewhere in between in remote sensing.

I think there is a natural evolutionary process here. And what we can do to hurry that along I don't know, Mr. Congressman. But it seems to be one of these things that almost has to take its course. And I sense that the various space nations are still thinking through the various aspects of large space structures in terms of their own national interests. I would hope that the outcome of that might be an idea of possibly some internationalization.

I heard with interest yesterday one of the witnesses talk about the possibility of viewing these large space structures as having discrete

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parts, some of which could be internationally owned and some of which could continue to have a national character. It is an interesting idea, and one worth pursuing.

Mr. Brown. I think that witness developed a rather complex scheme, which he doesn't pretend to understand, although I want to study it more fully, which provided for several categories, A, B, C, and D, of participation and ownership in the whole range of services related to these structures. The point that bothered me was that yesterday's witness from NASA disclaimed any role for NASA in planning for those institutional arrangements, which I think probably is right. But what it means is that there is no place where there is a clear focus for this kind of innovative thinking, which may be very closely related to the ability of this country to maintain a preeminent position in global marketing of our technological competence in these areas, because it is the institutional barriers that are slowing down the deployment of some of these things.

I hope if you disagree with what I am saying that you will help my education a little by commenting.

Mr. Pedersen. Congressmen, I certainly don't disagree. I guess my point was to say that international planning for international modes of operations or institutions tends to occur when nations reach that point of believing or concluding that such an approach is in their interest. And I think we are in the process now where these countries are defining what their interests are here. I believe that is in some ways where the United States finds itself now. We are certainly not failing to pay attention to the possibilities for large space structures. The institutional issues are important.

Mr. Brown. Take this point which was brought up this morning at considerable length, that we are really running up against a very serious problem in this concept of the common heritage of mankind as it applies to space. Now, I think this is a problem, and we are into an adversary role with the majority of other countries, because they resent our technological ability to utilize these resources of space, whatever they may be, and they are trying to get even with us. They are trying to use whatever advantage they may have, which generally is their vote in the United Nations or some similar body, to equalize their comparative advantage.

Now, if we can develop an Intelsat model which provides a mode of participation, we may be able to resolve the adversary relationship and resolve some of those issues of access to both the electromagnetic spectrum and geostationary portion orbit sectors in a much more reasonable fashion. Is that an incorrect conclusion?

Mr. Terrell. I would like to observe that for different technology, different space technologies, the solution may turn out to be quite different. The Intelsat model is, I think, valid for large scale space structures for communications purposes. I don't think the Intelsat model is a very valid one for space launch capabilities. I think the solution we have reached there where we provide launch services to other countries and maintain complete control over the system ourselves is about the only one that is politically and institutionally practical.

Mr. Brown. But we may be running up against the problem here that other developing countries are now providing launch services also.

Mr. TERRELL. Yes, sir; but none of them are providing them on the basis of an Intelsat model. We are talking about individual countries. And I think we will continue to see that business, because of its close relationship to national security and national technological lead, maintained on that basis for a long time.

Mr. BROWN. Let me explore with you the security aspects of this for just a moment. With regard to this export control, what was the situation when we sold China the space communications system? I presume that had to go through the Communications Control Board.

Mr. TERRELL. It will have to. There has been no license issued. We have agreed with China to sell them a system under appropriate terms and conditions.

Mr. BROWN. And yet they are a Communist country which will make use of this system for their own purposes?

Mr. TERRELL. Yes. The decision to enter into that agreement was reviewed by the people who are participants later on in the munitions control process.

Mr. PEDERSEN. I can say, as a member of the NASA delegation that went to China and talked with them about this, that Mr. Terrell is quite right, no specifics have yet been worked out in terms of precisely what this communications satellite would look like in an engineering sense. The Chinese were told very clearly that the export and sale of that communications technology would be subject to the export control laws and procedures of the United States. And they understand that. And that would also include COCOM as well.

Mr. BROWN. But we have exported other communications satellite systems to other countries.

Mr. PEDERSEN. U.S. industry has, yes, sir.

Mr. BROWN. Don't we provide a system to Algeria, or someplace like that, or Brazil?

Mr. PEDERSEN. Well, American industry has had a hand in most communications satellites in terms of the manufacture of them, because we have been the leader in that technology. In that sense, yes, sir, most communications satellites that are functioning have a U.S. technology input.

Mr. BROWN. Are any of you prepared to comment on space policy change that took place a few months ago after a Presidential review process in which the resolution capacity was altered slightly and some other things happened of that sort? I am a little hazy on this, but what I am trying to get at is the impact of the military/civilian interface as reflected by our military reconnaissance satellite and our Landsat resource sensing satellites. I have been trying to understand in my own mind the impact that this interface has on our ability to deploy these systems commercially on a global basis. What I am soliciting is a comment as to the extent to which this is a problem with the development of these new institutional arrangements that I am suggesting might be desirable.

Mr. TERRELL. I can take a crack at it, simply as a participant in the process.

I would express the conclusion that this kind of an issue is not an important question in the deployment of these systems on a global basis. I think the system that we are operating and planning to operate falls very far beyond the capabilities, or I should say this side of the capabilities——

Mr. BROWN. Outside the range?

Mr. TERRELL. Outside the range, yes. And that is by such a large amount that I don't think it is really a problem.

In space remote sensing I think the institutional problem differs from the Intelsat model in two ways. One is the maturity of the technology and the maturity of the national decision to carry it out. And there we are a long way from where we were when we set out in Intelsat. We just now are getting out of our experimental program and thinking about an operational program.

The other big difference is the established rate structure for message traffic that existed in the communications business long before there were any communications satellites. And that was sort of carried on en masse into the communication satellite business. We don't have an established rate structure for remote sensing data. And I don't think we even have a clear idea of the principles on which such a rate structure will be set up. Mr. Pederson in his testimony discussed a few of these problems. It could be that in the case of remote sensing systems we will not move toward an Intelsat model or toward the autonomous space launch capability model, but maybe we will move toward an intermediate model of national programs which are very carefully interrelated so that we understand among ourselves very well what the other person is doing, and what we will do, and we understand that those relationships will be carried out in a way to maximize the benefit to everybody without cutting through the barrier of the national programs. This can be the direction it moves into, I don't think that is inconsistent with the idea of greater industrial participation in space remote sensing should the U.S. industry come forward to want to do it. But if U.S. industry does come forward and wants to do it, then I think there has to be a degree of Government control, or regulation, on questions of international use and participation, just like there are Government regulations in the communications case.

Mr. PEDERSEN. I would just add to that, Congressman Brown, that in the remote sensing area, for example, one finds that the primary interest of most countries is not to have their own remote sensing satellite, but to have ready access to the data and to be able to use it effectively in terms of their own development planning. I think both Mr. Terrell and I referred in our testimony to steps recently discussed at the UNCSTD Conference, which we are taking now in trying to build and further the institutional structure on a regional level to assist these various countries, many of whom are among the least developed countries in the world, to more effectively organize and improve their capability to use this kind of data. So in that area I think we are seeing some significant movement in terms of building an institutional framework. I would agree with Mr. Terrell that you have to look at each technology almost in terms of what the institutional need is and what objective is to be obtained.

Mr. BROWN. I would agree with that. And I think that our initiative in suggesting the need to develop a regional or national conference is extremely sensitive from our standpoint. But from their standpoint they sometimes would feel that we are a little patronizing, since we are doing nothing to alleviate the problem of who controls the right to censor information from national territory or to disseminate the results of that, because we can take the position as part of that policy that

should be freely available to everybody. And that point needs to be considered also if we are going to have full cooperation with the less-developed countries.

Mr. FLIPPO. The distinguished and knowledgeable gentleman from Kansas, Mr. Winn.

Mr. WINN. Thank you, Mr. Chairman.

I think Mr. Brown made some good points. And having just returned from the Vienna Conference, it seems to me that we are approaching the technology transfer problem from an institutional standpoint. I think I can see a lot of problems. One, that maybe Mr. Terrell would like to comment on, is along basically the same line that George talked about. What is the impact of the Moon Treaty on private industry, such as private industry's involvement in the industrialization of space?

Mr. TERRELL. I am not a great legal authority on the Moon Treaty, but my own impression of it from the policy standpoint is that it should not have a serious impact. What we have set forth there is a regime that establishes the principle that there will be some kind of regulation—if it ever becomes practically desirable—that will satisfy the needs of all nations. We have already recognized that the Moon is not subject to sovereign claims, we can't take that back. And my understanding would be that that practical regime would depend on the practical circumstances. In defining that, I think the U.S. Government would support the interests of its industry. And naturally we would be in one of these give-and-take situations as we always are. But obviously the incentives to industry would have to be sufficiently great with respect to the benefits that could accrue to both the industial country and to user countries around the world to make that industry want to go in and do the job.

For those reasons I don't see any immediate impact. And I think that the long-term impact would be manageable.

Mr. WINN. I think you are a little more optimistic than I am, based on the Law of the Sea.

Mr. TERRELL. I know what you mean; yes.

Mr. WINN. Mr. Knowles, there is just one short question. I don't understand how an article gets on the commodity control list in the first place.

Mr. KNOWLES. An article may get on in a number of possible ways for national security purposes, before it is put on by the Commerce Department it is thoroughly discussed with the advisory agencies, particularly the Department of Defense; it is worked out through the COCOM list review, and it becomes a part of COCOM embargo. The exception to this procedure would be the approximately 38 items that are on the Commerce list only.

Mr. WINN. I had an example of a small computer company wishing to sell its product to Russia. The technology of a much more complicated, more sophisticated computer had already been sold to the Russians by a much larger company. But when this small company tried to get a licens to sell their computer their request was bounced back and forth and back and forth. I don't know if the guy has got a decision now, but I know he lost the business, thanks to the U.S. Government.

Mr. KNOWLES. I am not aware of the particular case, but I would be happy to look into it.

Mr. WINN. I know you are not. The owner claimed that his system was far less sophisticated than the ones that have already been sold to the Russians. What happens in a case like that?

Mr. KNOWLES. I can assure you that we do pay attention, and we will continue to. The problem in this particular case I really can't comment on because I don't know the facts.

Mr. WINN. I know you can't. He said it might be slow. I know it is slow.

Mr. KNOWLES. Again, there are undoubtedly reasons for the delay. It may depend on the potential end-use, the potential for diversion, and a number of other questions that could have come up. If you are willing to give me the name of the case I would be more than happy to look it up and give you a response.

Mr. WINN. If the man is still in business and alive I will be happy to.

Thank you, very much.

Thank you, Mr. Chairman.

Mr. FLIPPO. Thank you, Mr. Winn. I appreciate that.

We would like to submit questions for written response if you do not object. I thank you very much for your testimony.

Responses to questions from the Subcommittee on Space Science and Applications, September 6, 1979, to Kenneth S. Pedersen, regarding International Space Activities.

QUESTION 1

Do you foresee new initiatives on NASA's part in international space cooperation? Why or why not?

ANSWER:

International cooperation will continue to be a major part of the U.S. space program. NASA has what we believe is an effective dialogue with foreign space agencies which permits early identification of new areas of mutual interest for cooperation. The Announcement of Opportunity (AO) process serves to notify both individual scientists around the world and foreign agencies sponsoring space-related research of opportunities for ground-based work and flights on NASA spacecraft. For example, during 1979, six announcements have been issued so far describing the possibility of participation in a variety of space science and applications programs. In addition, as indicated in my testimony, NASA regularly exchanges across the board space science and applications program planning information with Canada, the European Space Agency (ESA), and the United Kingdom and initiates discussions on more specialized areas when we feel that a particular country or group of countries may have a significant contribution to make.

We are in the early stages of discussing a number of areas which are likely to be the basis of future cooperative projects. One such area is geodynamics. A global perspective and the active participation of many countries is required in order to reach the national objective of understanding the movement of tectonic plates and transcurrent plate boundary phenomena, as well as conducting a broader study of other types of plate boundaries and crustal deformation measurements. Therefore, NASA has been seeking out key scientific organizations to establish a basis for cooperative geodynamic research programs in Central and South America, New Zealand, Australia, the Pacific Islands, Japan, and Europe.

As NASA's space science and applications programs mature and extend into new areas and as the Space Shuttle and Spacelab demonstrate their versatility, additional opportunities for international space cooperation initiatives will naturally arise.

QUESTION 2

Does NASA have a program or strategy to transfer space technology and data to the developing nations? If so, what initiatives in this regard are being/will be pursued? What contributions are made by the United States/the recipient nation? What is the level of effort (funding) and which agencies are involved?

ANSWER

NASA has since the 1960's been actively involved in ensuring that the benefits of space technology are shared by developing as well as developed countries. This involvement has ranged from the development of voice and video satellite communications techniques linking remote areas with the world around them to the demonstration of solar energy systems which can power water pumps and grain grinders in rural villages.

In conducting these activities, NASA has considered the use of space-related data and techniques by developing countries to be an integral part of NASA's ongoing research, development, and demonstration programs; no separate program focusing on developing country needs has been established. In addition, NASA has worked closely with AID and other development assistance agencies to ensure that NASA-developed techniques are being utilized as fully as possible by interested developing countries.

Remote sensing of the Earth's environment--particularly land resources through NASA's Landsat satellites--is the NASA program in which there has probably been the broadest participation by developing countries. Under this program NASA has:

- Conducted cooperative investigations activities under which NASA acquired and made available Landsat data in exchange for reports on the usefulness of the techniques being investigated.

- Permitted the establishment of foreign-funded Landsat data acquisition stations which are providing timely and more complete coverage of developed and developing regions alike.

- Worked with AID in its efforts to train developing country users in the analysis of Landsat and other remote sensing data. This training is occurring both at the national level and at a number of AID-sponsored regional centers. (We understand AID is committing roughly three million dollars a year to these training activities.)

- Shared information on its plans for future Landsat-type satellites both with countries contemplating their own remote sensing satellites and with those states actively using Landsat data. These information exchanges, which were discussed at the recent UN Conference on Science and Technology for Development (UNCSTD), will continue and are expected to result in nationally-operated remote sensing satellite systems in the 1980's which produce compatible and complementary data for users around the world. In this connection, the U.S. has proposed that the developing countries call regional meetings (in which the U.S. and others could participate) to discuss how the

improvements in remote sensing satellite capabilities in the 1980's can be most effectively utilized in support of national development programs.

NASA will continue to carefully consider the potential benefits of space technology and space-derived data for developing countries as its future programs are developed. A good example of this is Landsat-D, which will collect data in seven spectral channels and with greater spatial resolution than is currently available from Landsats-2 and -3. This data should be valuable to developing countries interested, for example, in better monitoring of agricultural crops grown in small fields.

QUESTION 3

What are the most critical needs of the developing nations in terms of utilizing remote sensing data? Hardware? Training? Institutional infrastructure? Financial aid? What type of project is most useful to develop an indigenous capability?

ANSWER

In my view, the continued availability of remotely sensed data on a timely and complete basis is the prime and critical need at this time. Secondly, training programs in techniques to analyze remotely-sensed data and integrate this knowledge effectively into ongoing operational programs such as agriculture, hydrology, desertification, are also a critical need at this time. The knowledge itself is not enough if it is not used in the management of the country's resources. Training should not just emphasize how to analyze data, but should also attempt to integrate remote sensing techniques into projects which can benefit from the capabilities of this technology. The real test of remote sensing technology is not in demonstrating an application, but in getting the individuals and agencies which would benefit from the application to integrate it into their regular programs.

QUESTION 4

One of the major complaints regarding the Landsat system is that the lack of commitment to an operational system discourages domestic users from making the investment in personnel and equipment to develop Landsat capabilities. Is this true of international users?

ANSWER

This Administration is committed to providing continuity of Landsat data through the 1980's. This commitment has helped reassure international users who have been willing to make major commitments of funding and skilled, trained manpower, (both scarce resources for developing countries) in order to participate in the benefits derived from the remote sensing technology.

QUESTION 5

Currently, the price of Landsat data is the cost of its reproduction. In an operational system, particularly if it is owned by a private entity, there may be a change in pricing policy to reflect the true costs of owning and operating the system. How would such a price increase affect the developing nations' use of Landsat data? Should there be reduced-charge subsidies for the developing nations?

ANSWER

NASA feels the price of data obtained by an operational terrestrial observations satellite system should reflect the cost of operating that system. International users, either developed or developing, who have already invested their scarce resources for equipment and the training of skilled personnel so as to better apply remote sensing technology will, in my judgment, be prepared to purchase data from an operational system so long as the prices charged are equitably applied.

One approach for lesser developed countries, as I stated in my prepared statement, would be to encourage greater developing country use of space systems through loan and technical assistance programs targeted toward countries unable to finance such capabilities on their own. This technical and funding support is currently available through U.S. and foreign development assistance programs and through international lending institutions such as the World Bank.

QUESTION 6

Please comment on the House Science and Technology's panel on international space activities recommendation #2a regarding an equitable pricing policy for space communications, Earth observation data, and launch services. Could you please comment on the implications of reduced charge subsidies for developing nation users?

ANSWER

In considering this recommendation, it should be noted that several space services of particular benefit to developing countries--for example, Landsat and meteorological satellite data--are now available at either nominal or no cost. Other services, such as satellite launchings (based on actual costs), and analysis hardware (sold commercially) for remotely-sensed data--are, of course, more costly.

Rather than arbitrarily reducing price levels to certain classes of users, NASA believes the best approach to encouraging developing country use of space systems services is through loan and technical assistance programs for those countries which are not able to finance the entire cost of space utilization on their own. Such

technical and funding support is currently available through U.S. and foreign development assistance programs and through international lending institutions such as the World Bank.

QUESTION 7

Is NASA currently conducting or contributing to training for specialists in developing nations so that they can improve their use of satellite data? If so, how extensive is this program?

ANSWER

NASA contributes experts in remote sensing technology from our various research centers to attend seminars, conferences, and training sessions sponsored by the UN, AID, and the World Bank, and other organizations set up to offer training in remote sensing for developing nations. We do not have the primary mission of providing training to foreign users of Landsat data, but provide information on training as well as documentation on NASA studies in the application of Landsat data.

QUESTION 8

What is NASA's view on the concept of multidisciplinary, regional, remote sensing centers for the application of satellite data to development?

ANSWER

NASA support the useful concept of multidisciplinary regional remote sensing centers. To implement this, NASA is working closely with AID in its efforts to establish such regional centers for training and for conducting projects involving the use of Landsat and other remotely-sensed data. Three centers are currently operational in Africa (Upper Volta, Kenya, and Egypt) and two more are planned (Nigeria and Zaire). A regional center is under development in Asia (Bangkok) and two further centers are contemplated in Latin America.

ADDITIONAL QUESTIONS

QUESTION 1

Please comment upon the recommendation #7 of the House Science and Technology's panel on international space activities which says that present procedures inhibit the effectiveness of U.S. industry in competing for international procurements and recommends that the control process for space-related exports to be streamlined and simplified.

ANSWER

When short deadlines for company responses to international procurement requests have existed, NASA has accelerated its export control review in order to expedite its advice

to State and Commerce Departments. We are not aware of any specific situations in which U.S. firms have been significantly disadvantaged by export control procedures.

QUESTION 2

Technology transfer and cooperation can be economically and politically beneficial. However, there is claim by some space system developers that export control administration seems to be an adversary process - government versus industry - when in doubt deny the license rater than grant the license. Do we fully understand the potential benefits of a positive export policy?

ANSWER

NASA does not view the government/industry relationship as an adversary process. Our relations with industry have been supportive and cooperative. In many instances industry representatives seek guidance and advice from NASA in the early stages of their international negotiation to avoid pitfalls and obstacles downstream. Further, during the implementation phase of programs, NASA/industry consultation provides us with insights into future foreign intent and capability. In the course of these informal consultations, we encourage the export of hardware and services which, in turn, creates dollar in-flow and helps industry sustain a viable labor base.

QUESTION 3

How do we assure that our export control policies do not adversely effect our industries and closely-related jobs? It is my understanding that frequently there is a deposition to allow export only of what others have rather than what they do not have, locking U.S. industry into a losing market position. Can the review process be made to take a more positive approach?

ANSWER

The review process within NASA not only takes into account the foreign availability of a particular item, but also the appropriateness of the item to the end-use, the ease by which it could be reverse-engineered in the case of advanced technology, and in the case of manufacturing assistance or lease agreements the impact upon the ability of our industry to compete for finished products. As a general rule, the exportation of hardware is encouraged over the exportation of technology.

QUESTION 4

Future Space R&D Programs as well as now space programs can become sufficiently large as to require international cooperation. What is being done to facilitate such cooperation where exchange of information may be essential?

ANSWER

As I indicated in my testimony, NASA has been striving to create with our foreign partners a climate where we both have a basic mutual understanding of our respective capabilities, objectives, and plans to allow both sides to make program and policy decisions in a more fully informed environment. More specifically, we currently conduct periodic meetings with foreign space agencies aimed at exchanging program and planning information. These periodic meetings, plus other ad hoc opportunities, will, I believe, continue to provide the necessary basis from which international space cooperation can expand.

QUESTION 5

What restrictions are placed on U.S. industry use of foreign launch vehicle services such as the European Space Agency's Ariane? Does a U.S. corporation require U.S. authorization? Do you believe such a requirement should be imposed?

ANSWER

No restrictions are placed on U.S. industry use of foreign launchers. The only U.S. authorization which would be required is an export license for the payload. Although we would prefer to see U.S. payloads launched by U.S. vehicles (and feel that the Space Shuttle will offer definite economic advantage in the 1980's), a rigid U.S. requirement to use domestic launch services would probably invite retaliation thus depriving the Shuttle of a significant number of prospective payloads.

QUESTION 6

What role, if any, does the National Security Export Control System play in the establishment or sale of Earth resources ground stations to other countries?

a) Recently there has been much criticism of the amount of time which is required to obtain export licenses. What is the average length of time required to obtain a license?

b) I am told that the inability to obtain an export license in a timely manner has in a number of cases resulted in industry loosing out on important markets. How can this process be accomplished in a more timely manner?

ANSWER

Landsat ground station exports for the most part are shipped under general license under Department of Commerce Export Administration Regulations. There are certain items within the ground station which require special licenses such as the computer systems and the digital analyzers. Normally, the review process within NASA on either Commerce or Munitions cases takes about twenty work days, which allows for referral to technical experts and administrative

processing. We do not know of any cases wherein excessive time by this Agency has caused loss of important markets.

QUESTION 7

History has shown that the U.S. can apply the result research and technology at a faster rate and more effectively than anybody else in the world. This capability puts our industry in an advantageous position. What can be done to assure that our export control policies do not inhibit this advantageous position?

ANSWER

Export control policies should enhance the industry's advantageous position of being able to absorb and apply the results of research and technology. By the denial export of advanced and critical technologies, U.S. industry should be able to produce the fruits of technology growth and be able to market these fruits in the world marketplace. The U.S. policy of encouraging the sale of space hardware and services and holding back the production know-how and the underlying methodology behind advanced hardware certainly complements industry's advantageous position.

QUESTION 8

What studies, if any, are underway in the executive branch for streamlining and simplifying export control procedures? When do you expect such procedures will be implemented?

ANSWER

While there is always room for improvement, we are not presently participating in any executive branch studies concerned with simplifying or streamlining the export control procedures.

QUESTION 9

Do the roles of respective agencies which participate in export control need to be clarified?

ANSWER

We do not feel that clarification of the roles of the agencies involved in the export control is required.

Responses to questions from the Subcommittee on Space Science and Applications (Honorable Larry Winn), September 6, 1979, to Kenneth S. Pedersen, regarding International Space Activities.

QUESTION 1

I appreciate the concept of mutual programmatic benefit which NASA uses for evaluating cooperative programs. However, it is conceivable that the mutual benefit aspects sould be met but one partner may gain a substantial competitive advantage in the world market. Is this aspect even considered?

ANSWER

Yes, industrial competitive consequences are taken into account in making the mutual benefit calculation. As I indicated in my prepared statement, NASA's cooperative programs are designed to avoid the leakage of critical U.S. technology. Prior to entering into a proposed cooperative undertaking, we assure ourselves that not only does our cooperative partner have the financial resources but also has a demonstrated technical capability to carry out its own responsibilities, so that the export from the U.S. of sensitive advanced technology is minimized. Moreover, responsibilities are structured and implementation plans defined so as to assure full protection of industrial proprietary rights on both sides.

QUESTION 2

The philosopical goals of providing resource information and educational services with satellites to lesser developed nations is very commendable. However, I cannot help but wonder whether sufficient attention is given to the economic impact on our own nation. Do you feel that sufficient attention is given?

ANSWER

NASA's cooperative activities are based on the concept of mutual interest and benefit and are not giveaway programs. In the case of cooperative projects with developing countries, the latter "pay their own way," funding their own responsibilities. For example, in the 1975-1976 Satellite Instructional Television Experiment (SITE), NASA made available the ATS-6 satellite for a period of one year and the Indians funded all the ground-based activities and shared the results with us. With regard to Landsat ground stations in foreign countries, such as the one in Brazil, the foreign authorities cover all of their ground-based expenses and provide NASA with a backup readout capability in case of Landsat tape recorder failure. Our experience has been that the economic impact on the U.S. has generally been favorable because sales of equipment and services by U.S. firms have been stimulated.

QUESTION 3

You addressed the issue of growing space technology competition from such countries as Japan, France, and Germany. Further you stated this competition was being met by placing a high priority on the advanced research and development. However, when looking at the ratio of R&D expenditure to the gross national product, the U.S. is falling considerably behind the other nations. In light of this, are we really giving a high enough priority to R&D?

ANSWER

We do not feel that there is a basis for reasonable concern about NASA fulfilling its obligation as an R&D agency. Dr. Frosch, in his testimony before the Congress earlier this year, underlined the fact that in the face of a most austere Federal Budget which aimed at reducing the annual deficit by nearly 50 percent, the President's FY 1980 budget request of some $4.7 billion reflects the importance of civil space research and development for the future. For example, the President's budget request for NASA's research and development activities includes a funding increase of approximately 20 percent for both space science and space applications. In order to help avoid erosion in our longer term technical capabilities, NASA is re-entering selected areas of communications technology research and development starting in FY 1980. The FY 1981-1982 planning estimates contained in the President's budget provide some flexibility for continuing to enhance our research efforts and initiating next-step development activities.

NORMAN TERRELL, DEPUTY ASSISTANT SECRETARY, OCEANS AND INTERNATIONAL ENVIRONMENT AND SCIENTIFIC AFFAIRS, DEPARTMENT OF STATE

Question. Does the Department of State include space technology transfer as a part of its foreign aid program? If so, have such efforts been successful?

Answer. AID has just initiated (August 1979) a major applications program in the use of communications satellites. Its objective is to help LDCs develop and test the use of small earth stations for providing domestic communications in rural areas. AID's project will provide core funding of $24 million over 6 years, with at least half of the funding designed to assist in the local utilization and software development requirements of ministries of health, agriculture, and education which will be using communications to support community-level efforts. In addition, AID will help lease capacity on INTELSAT or other operational systems such as Indonesia's PALAPA system and will provide earth stations as related hardware. Both radio broadcasting and 2-way communications will be tested. Initial agreements have just been signed with Peru, for a three-year pilot project in the eastern jungle area of that country, and with the University of the West Indies (U.W.I.) for an analysis of the use of public service telecommunications among the several island nations making up U.W.I. Support is also being provided by AID and NASA to the University of the South Pacific, using ATS–1. Prior efforts by AID have been in the nature of short-term demonstration, ranging from 1-day linkages by satellite to 26 LDCs in 1976 to a very successful and informative three-month demonstration at U.W.I. in 1978. In addition, substantial analyses have been done of the applicability to LDC development problems of satellite experiences to date, such as those in India's Satellite Instructional Television Experiment ("SITE") project, Alaska's health services project, and the educational programs of the Appalachian Regional Commission. These analyses have suggested that there is a reasonably high possibility of succeess in applications to a number of LDC problems, and have provided a basis for the new AID Rural Satellite Program. An attached brochure provides further information.

AID has put a great deal of effort into remote sensing and the transfer of technology in the use of Landsat data through workshops, symposia, classes and grants. A reflection of that effort has been the establishment of two regional remote sensing centers in Upper Volta and Kenya and the planning of possibly three more (Thailand, Costa Rica and Bolivia). In addition, national local centers have been set up (Egypt, Tunisia, Zaire).

Question. Is there a large demand from the developing nations for space-derived data and services?

Answer. With regard to space communications services, the demand for LDCs is yet to be tested fully. We will know better in a few months, after knowledge of the AID Rural Satellite Program becomes more widespread and deliberations proceed at the WARC and at a UNESCO-sponsored meeting in Washington in November. Proposals for world-wide services for the LDCs have been put forward, most recently an International Telecommunications Union (ITU) proposal for a global domestic satelite system, "GLODOM", designed for the LDCs and there is, in addition, a great deal of ongoing rhetoric about the "New World Information and Communications Order" in such forums as UNESCO and WARC; however, the relative priority placed on this area is still not entirely clear. There is no question that it is growing and that, in addition, access to communications capacity, training, and information has become a major political area of concern within the third world.

With regard to remote sensing, the present demand is large, and we anticipate it will be increasing as a result of the U.N. Conference on Science and Technology for Development (UNCSTD) that took place in Vienna in August 1979.

Question. What problems have been encountered in space technology transfer efforts?

Answer. We are at an early stage. At this point, mechanisms are in place to deal with foreseeable problems of appropriate hardware and maintenance and effective development of information, content, and software on the utilization side. Two problem areas remain. The first concerns familiarity with, and acceptance of, space communications applications by our Embassies and AID Missions, for which this is new and for which they are not well staffed. The second will be in ensuring appropriate operational satellite capacity, and support, as we move from pilot projects to wider use in the early and mid 1980s. On the satellite side, the technology exists to provide services to rural and remote areas by small

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inexpensive ground stations; the problems will be to ensure a sufficiently-aggregated market to make provision of such services economically feasible and to deal with regulatory and policy constraints to poor and sometimes small countries.

Additional receiving stations are needed in East, West and Central Africa, and Central and South America for remote sensing. This will help to correct the problem of delay experienced by the LDCs in obtaining imagery.

Question. What legislative or administrative initiatives are necessary to strengthen space technology transfer programs? What level of funding/personnel would be required?

Answer. With respect to communications, it is not at this time clear what, if any, new initiatives might be required or be appropriate. Additional staff, funding, and organizational prominence always seem desirable from the standpoint of particular priorities such as these. Regretably, in the absence of an addition to total resources for the foreign assistance program, such additions would have to come from other areas of current or new priority. Further, within the AID program, neither space application, per se, nor communications applications have been designated by the Congress on the Administration as areas of special priority.

A significant step taken at UNCSTD by the United States was to point out the need for better coordination among producers and users of remote sensing data. It was noted that incompatibility in receiving station equipment and image scales among the countries that obtain Landsat data is significant and any further proliferation of receiving station capacity without taking these issues into account will make matters worse. The U.S. is taking the initiative among the data producer community (France, Canada, Japan, etc.) to provide integration and coordination among the producers of remote sensing imagery. At this point, present funding and personnel levels are adequate to move in this direction. A modest increase in these areas may be needed later as we identfiy a program of action.

Question. What type of project would be most useful to the developed nations in establishing an indigenous space utilization capability?

Answer. Relating to communications, two things have priority: first, support for the establishment of projects which demonstrate applications within individual LDCs so that experience and trained staffs are developed, and a sense of mastery over the technology is generated by user institutions; second, the development of local or regional institutional capacity to plan, to assess alternatives, to budget, to train, to evaluate, and to provide technical assistance to user agencies within each nation. These two priority activities often succeed only if they occur together.

Investments in training of host country personnel in the technology of remote sensing, especially with respect to the interpretation of satellite imagery, would be the most important type of project. This initiative should be accompanied by institution-building investments to assure that such knowledge becomes part of the S & T infrastructure of the LDCs.

Question. Is there anything the State Department can do to enhance the availability and application of space technology by the developing nations, particularly the AID-graduate nations?

Answer. Yes, we have initiated a series of discussions with remote sensing satellite operating and user states to ensure insofar as possible that future programs are complementary and that data from them is compatible. In addition, AID and ICST are working to develop programs and projects to ensure that both developing states and AID-graduate nations can apply space technology to meeting their needs.

Question. Is there anything which the State Department could do to enhance international space cooperation? What role might the State Department play in increased dissemination of space applications data to users throughout the world?

Answer. The answer to this question is essentially the same as the answer to question 3. We are actively seeking opportunities through both bilateral and multilateral consultations to enhance international space cooperation. Our main effort at this time is to increase cooperation and coordination in remote sensing.

Question. Has the State Department's Munitions Board list of spacecraft and space-related technologies been reviewed recently with a view toward removing all items which it is not essential to have on the list? If so, has any technology been removed? Why or why not?

Answer. On several occasions, the past three years, the Department of State's

Office of Munitions Control, in consultation with other U.S. Government agencies, has examined the question of whether spacecraft and related technologies should be removed from the Munitions List and placed under Commerce's jurisdiction. Every time the results were negative, primarily because of security reasons. Specifically, the Department of Defense maintained—and the other agencies did not question the DOD views—that the technologies that go into building manned or unmanned peaceful spacecraft, including communications satellites, is essentially the same as that used in manufacturing military satellites. Further, it held the technology utilized in making certain spacecraft sub-systems is about the same as that used in strategic delivery systems and other sophisticated military weaponry. Similarly, a launch vehicle placing a peaceful satellite in orbit is not much different from a ballistic missile; the same technology builds them both.

Technology transfer is of particular concern to DOD. Once transferred, it is difficult to control and impossible to have it recalled. The fact that it is initially utilized for stated civil purposes is no guarantee that it may not later be used for military purposes. There is no sure way to detect diversion or transfer to third countries. These difficulties do not apply to transfers of space hardware. For this reason, consideration was given to placing nonmilitary spacecraft equipment under Commerce license. But the idea was turned down as impractical. Split jurisdiction over a commodity wou'd create new problems—without solving the old ones—and would be more time-consuming to implement for both industry and government than the present set up. Merely transferring spacecraft to another agency would not alter the inherent military nature of the technology; nor would it likely reduce processing time since Commerce would still have to coordinate with Defense and NASA.

Question. Is there any possibility that the activities of U.N. specialized agencies may impinge on U.S. space goals and plans? How might U.S. space activities be enhanced through further cooperation?

Answer. It seems unlikely that U.S. space goals and plans will be impinged upon by the activities of U.N.-specialized agencies. U.S. space activities have been influenced through U.S. ratification of four treaties dealing with outer space whereby we, and others, have accepted obligations with regard to the use of space. However, it is clear that the U.S. acceded to these treaties only after determining that their terms were not inconsistent with U.S. space policy and objectives. The same would hold true if considering whether or not to ratify future treaties.

Question. What can the United States do to assure greater access by the developing nations to space and space benefits?

Answer. The United States should continue to provide data from remote sensing programs to developing nations as directly as possible and at a reasonable cost. We should also continue to work with them in developing new uses for remote sensing data which will assist their development planning process. To those developing nations who have the interest, we shou'd continue to encourage their use of the Space Shuttle to enable them to orbit satellites or conduct scientific experiments in space.

Question. In 1978, the House Science and Technology panel on international space activities recommended that two specific actions be taken to increase developing nations' participation in space activities: definition and implementation of an equitable pricing policy for communications and earth observation and establishment of a policy and methodology for equitable non-discriminatory dissemination of data and information from earth observation systems. Please comment on these two suggestions (pros and cons) and add any other suggestions you may have to increase developing nations' access to space and space benefits.

Answer. In considering the establishment of equitable (lower prices for LDC users) pricing policies for space services, it should be noted that several space services of particular benefit to developing countries—for example, Landsat and meteorological satellite data—are now available at either nominal cost or reproduction or no cost. Other services, such as satellite launchings (based on actual cost), and analysis hardware (sold commercially) for remotely sensed data are most costly. Reduced costs for space launching is the object of the U.S. Space Transportation system and any reduction below the actual costs of launch would require subsidization.

Rather than arbitrarily reducing price levels to certain users as a first step, developing countries should be encouraged to take full advantage and make maximum use of technical and funding support currently available through U.S.

and foreign development assistance programs and through international lending institutions such as the World Bank.

As the Panel report noted, U.S. policy has been and is to ensure that "data and results from civil space programs will be provided the widest practical dissemination." In the case of our scientific satellite activities, data are provided to U.S. and foreign investigators and available on request at a nominal charge to others from established national and international scientific data centers. Landsat data of particular international interest is publicly available at a nominal charge through a U.S. data dissemination center in South Dakota and through foreign-operated Landsat stations around the world.

It is difficult to see how a centralized global facility would be able to provide more efficient service than the present Landsat facilities, for example, particularly information and data of regional interest. It would appear that continued improvements in efficiency of the present distribution systems would be the more desirable approach.

Question. How would the U.N. specialized agency role for promotion of space technology utilization be strengthened?

Answer. The Food and Agriculture Organization, the World Meteorological Organization, and the U.N. Space Applications Program, among others, play an important role in assisting developing countries to take increasing advantage of the benefits of space technology. Various USG agencies already provide training for developing country officials in conjunction with on-going U.N. programs. The programs conducted by these U.N. agencies could be strengthened through increased funding. However, tight budget limitations on the U.S. contribution to the United Nations would seem to rule this out as a present possibility.

Question. Do U.N. member nations generally perceive the value of space applications and do they have any suggestions for increasing the application of space technology to the problem of the developing nations?

Answer. The value of space applications is appreciated by most members of the United Nations and many U.N. members have made suggestions on how to increase the use of space applications to meet the problems of developing nations.

Question. What has been the reaction of the developing nations to U.S. suggestions for development of multidisciplinary, regional, remote sensing centers for the application of satellite data to developing? Is there support from other developed nations for such a concept? Has anyone proposed mechanics for development of such regional centers? What funding levels would be necessary for such an effort:

Answer. The enthusiasm in the LDCs for the regional remote sensing centers is tremendous. Costs for these centers is tremendous. Costs for these centers will amount to about $2.5 million to $3 million, over a five-year period. If a receiving station is included, the cost would be in the neighborhood of $8 million. A receiving station is being build in Thailand by the Asian Institute of Technology under AID sponsorship. There are centers in Ouagadougou and Nairobi. The former is run mostly by the French but with Canadian, United States, Upper Voltan and maybe even German cooperation. The Germans are interested in providing an antenna in Upper Volta. There have already been three training courses held in Upper Volta and each one was filled. A fourth course is just starting.

There is a center in Nairobi, sponsored by AID, the Economic Commission for Africa and the five countries which it serves (Somalia, Kenya, Uganda, Tanzania, and Malawi.) The center is associated with the Regional Mapping Center and plans are under way to build a receiving station that will be sponsored by the five countries.

Two centers in Latin America are being planned by the Latin American Division of AID and one in Syria, sponsored by AID.

Question. How efficient is the coordination of outer space activities among the various agencies of the United Nations?

Overall, coordination on outer space activities between various U.N. agencies appears to be satisfactory. The U.N. Secretariat circulates relevant information on space activities to all of the specialized agencies which can utilize space technology in carrying out their respective functions. The U.N. Committee on the Peaceful Uses of Outer Space is also kept apprised of these activities and these are included in the Committee's annual report.

Question. Were proposals presented at the recent U.N. Conference on Science and Technology for Development for greater availability of space technology for the developing nations? If so, what was the U.S. reaction to these proposals? What was the reaction of the developing nations?

Answer. At the UNCSTD the U.S. proposed that satellite operator states meet to discuss ways to increase cooperation in remote sensing and to ensure that to the extent possible, data derived from such programs is compatible so that user states can secure it as inexpensively as possible. After the initial meeting a series of regional conferences on remote sensing with developing countries may be arranged to promote the use of remote sensing data in the development process. Both satellite operators and developing states were enthusiastic about this proposal.

Question. Based on the experience of the recent U.N. Conference on Science and Technology for Development, what are the chances for a technically, rather than politically, oriented U.N. Space Conference.

Answer. We are striving to ensure that the planned U.N. Conference on the Peaceful Uses of Outer Space will focus primarily on technical issues; the tentative agenda for the conference indicates this should be the case. Nevertheless, we anticipate that some countries may attempt to raise political and legal issues.

Question. Please comment upon the recommendation No. 7 of the House Science and Technology's panel on international space activities which says that present procedures inhibit the effectiveness of U.S. industry in competing for international procurements and recommends that the control process for space-related exports to be streamlined and simplified.

Answer. State's OMC has and continues to streamline its export control procedures in cooperation with other interested U.S. Government agencies, as well as industry, to enable the latter to compete more effectively in world markets. To this end, most of the requests to export Munitions List products (i.e. space hardware and associated services and information as contracted with production technology and know-how) are licensed within a week and often without interagency review. Further, we allow aerospace firms to submit proposals abroad, in response to tender offers for non-military satellite programs, without the need to submit them for review and approval. Such approvals, which are subject to certain limitations, are granted because companies as a rule do not have sufficient time to prepare a proposal, submit it for review and approval, and at the same time be able to meet the due date of the proposal.

In general, we receive an average of about 30,000 cases a year, both space and non-space related. Two-thirds of these are processed within about a week. Nearly 17 percent require interagency review. The average number of applications pending more than 30 days is less than 400, and those pending more than 90 days average less than 60 at any given time. The most troublesome cases consist mainly of technical assistance and licensing agreements between US and foreign firms. By and large, these cases call for the disclosure of technology or production know-how and grant the foreign licensee various user rights, including third-country sales. They require careful technical review and analysis by both Defense and NASA. Processing them requires more or less 5 to 6 weeks, depending on such factors as the complexity of the agreement, the nature and level of the technology involved, and the degree of its military sensitivity.

There is an additional delaying factor with respect to certain technical assistance or manufacturing licensing agreement cases and contracts in the amount of $25 million or more. Section 36(c) and (d) of the Arms Export Control Act requires that such cases be transmitted to Congress for a 30-day wait before a license can be granted.

Question. Technology transfer and cooperation can be economically and politically beneficial. However, there is claim by some space system developers that export control administration seems to be an adversary process—government versus industry—when in doubt deny the license rather than when in doubt grant the license. Do we fully understand the potential benefits of a positive export policy?

Answer. Section 38 of the Arms Export Control Act of 1976, administered by State, PM/MC, authorizes the control of Munitions List articles and related technical data "in furtherance of world peace and the security and foreign policy of the United States." Additionally, a national policy, covering space-related matter in particular and in effect since 1972, requires that we encourage the sale of selected U.S.-manufacturing hardware and associated information and services where possible and avoid the transfer of the technology and know-how incident to the production of such hardware and services, especially in those areas in which the U.S. maintains a technological lead.

Munitions Control does not view its control functions in terms of an adversary process between government and industry, as claimed by some space systems

developers. The main object of our controls is to ensure that export of military technologies and equipment promote overall national objectives (i.e. world peace and the foreign policy and national security of the United States) which may not coincide with corporate goals. Exports and profits are given due consideration in the decision-making process; however, they are not the sole or determining factors.

Question. How do we assure that our export control policies do not adversely affect our industries and closely-related jobs?

Answer. Current national policy serves both foreign policy and national security objectives. It promotes space cooperation between the United States and friendly foreign countries by providing hardware and related service and information and at the same time enabling the United States to retain control of the production technology for security reasons. It also benefits both aerospace firms and labor by maximizing profit and creating new jobs or retaining old ones in the United States. The policy encourages the sharing of the fruits of the large U.S. space investment but discourages the sale of the fruit tree.

Question. Future space R&D programs, as well as new space programs, can become sufficiently large as to require international cooperation. What is being done to facilitate such cooperation where exchange of information may be essential?

Answer. International participation and cooperation has been a key element in the U.S. space program from the very beginning. The principle of large scale cooperative projects with the cost borne by both sides is well established in the U.S. space science program. Major contributions are being prepared by a number of countries for launches scheduled within the next few years. The meteorological satellite program has realized substantial benefits from instruments provided to U.S. spacecraft, and the information derived from these has been widely shared.

Question. What restrictions are placed on U.S. industry use of foreign launch vehicle services such as the European Space Agency's Ariane? Does a U.S. corporation require U.S. authorization? Do you believe such a requirement be imposed?

Answer. Until the advent of the Ariane launch vehicle, which is yet to be tested in a space launch, there has not been a source of foreign launch vehicle service suitable for launching most payloads being prepared by U.S. manufacturers. We are not aware of any restrictions on U.S. industry for availing themselves of any such foreign services. Export of space hardware outside of the United States would require a license from the Office of Munitions Control. Export of hardware to foreign subsidiaries or affiliate companies has occurred and quite possibly could be used in Ariane launches, for example.

Question. What role, if any, does the National Security Export Control System play in the establishment or sale of Earth resources ground stations to other countries? (a) Recently there has been much criticism of the amount of time which is required to obtain export licenses. What is the average length of time required to obtain a license? (b) I am told that the inability to obtain an export license in a time manner has, in a number of cases, resulted in industry losing out on important markets. How can this process be accomplished in a more timely manner?

Answer. Ground station receiving equipment is usually exported under a general license under Department of Commerce Export Administration Regulations. Certain items that are particularly useful to the processing and analysis of Landsat imagery, such as computers, digital analyzers, and special recorders, require special licenses. For most countries who have established or intend to establish Landsat stations, the export of such equipment has not posed any problem.

Question. History has shown that the United States can apply the results of research and technology at a faster rate and more effectively than anybody else in the world. This capability puts our industry in an advantageous position. What can be done to assure that our export control policies do not inhibit this advantageous position?

Answer. The very requirement for export control implies that in some cases, whether for national security or foreign policy, some limitation on certain potential exports may be effected. The availability of comparable equipment or technology from other sources could result in a disadvantageous position for U.S. industry unless the countries containing these sources can be persuaded to apply similar control. The United States, through COCOM and in certain cases through bilateral negotiations, has taken those steps necessary to effect the necessary controls without disadvantaging U.S. companies.

Question. What studies, if any, are underway in the executive branch for streamlining and simplifying export control procedures? When do you expect such procedures will be implemented?

Answer. We are not currently aware that routine export procedures pose any particular difficulty, although some streamlining might be possible. In cases involving foreign policy considerations, every effort is made to address the issues quickly and arrive at fully coordinated recommendations. Timely action is generally as advantageous to foreign relations as to U.S. manufacturers advantage.

Question. Do the roles of respective agencies which participate in export control need to be clarified?

Answer. The roles of the various agencies appear to be adequately defined in past and present legislation.

MAURICE J. MOUNTAIN, DIRECTOR OF STRATEGIC TECHNOLOGY AND MUNITIONS CONTROL, OFFICE OF INTERNATIONAL SECURITY AFFAIRS, DEPARTMENT OF DEFENSE

Question 1. Does the Defense Department have an active program to disseminate information on space technologies which could be of benefit in the civilian sector?

Answer. Space technologies under Department of Defense jurisdiction are usually developed by Defense contractors. Insofar as the technologies are unclassified they are thus in the civil sector automatically. Where classified technology is involved, the Department of Defense makes it available to the civilian sector through declassification when no injury to our national security is likely to result.

Question 2. Please discuss the Commerce/DOD critical technologies study. Has the review been completed? If so, have any space-related technologies been removed from the critical technologies list? Why or why not?

Answer. The review of critical technologies is a continuing exercise which has not yet been completed. Until this effort has progressed further, the removal of space-related technologies from export control would be premature.

Question 3. Has the Defense Department taken steps actively to assure that only those items which are essential to be on the critical technologies list are actually placed on the list?

Answer. The ultimate purpose of the Defense Department's current effort to identify critical technologies as precisely as possible is to insure that only those whose control is essential to our national security are placed on the list.

Question 4. If a potential technology exporter wants to appeal an adverse decision on export of a particular space-related technology, what processes are available to that person or company?

Answer. If the item is on the Munitions List, which is administered by the Department of State, appeals of adverse decisions should be addressed to the Director of the Office of Munitions Control in the Department of State. If the item is under Department of Commerce jurisdiction, appeals should be made to the Office of Export Administration of that department. Access to the other departments or agencies involved in a particular decision is best obtained through one of these two channels. Quite obviously, appeals from the judgment of these offices can be made by escalating the matter to higher political levels, including the Secretaries of each Department.

KENT KNOWLES, DIRECTOR OF OFFICE OF EXPORT ADMINISTRATION, DEPARTMENT OF COMMERCE

Question. What is the position of the United States vis-a-vis its foreign competitors in the area of commercial space technologies, particularly communications satellites? Has the U.S. position of leadership in this area been eroded? What has been the effect of a lack of federally funded R&D programs in this area? How have U.S. technology export policies affected the competitive status of U.S. companies?

Answer. The United States remains a world leader in telecommunications and satellite communications. We are by no means alone in the field, however. Other countries, notably Japan, have also mounted their own telecommunications and satellite programs; the Japanese indeed may also be considered leaders in this field and have been quite successful in selling their ground stations for satellite use. Over the past several years, the U.S. has been involved in several significant partnership arrangements with other countries and foreign companies which have resulted in substantial transfer of technology in support of common goals.

The matter of federally funded R&D programs in this area to stimulate innovation is one of the subjects included in a major ongoing study of industrial innovation, chaired by the Assistant Secretary of Commerce for Science and Technology under the cognizance of the White House Office of Science and Technology Policy. The findings of this very extensive study are expected to appear within the next few months. It would be inappropriate for us to anticipate the results here.

In our opinion, the restraints imposed by U.S. export controls have had only a limited effect on overall U.S. telecommunications exports. U.S. export policy on the whole has been to promote rather than restrain U.S. exports in the field of telecommunications and satellite systems and there has been a concerted effort to this end on the part of both the Commerce Department National Telecommunications and Information Agency (NTIA) and the former White House Office of Telecommunications Policy (now incorporated into NTIA, in Commerce). Also, a major subject of discussion with the Japanese in the recent trade talks was the need to open up the Japanese telecommunications industry on procurement of U.S.-produced goods.

Question. What role could and should the Commerce Department have in encouraging the international utilization of space technology?

Answer. As part of the Department of Commerce's overall charter to promote U.S. trade and industry, the National Telecommunications and Information Agency (NTIA) in Commerce has a specific mission to help Commerce to fulfill that charter as it pertains to the overall telecommunications field. NTIA has been formed in recognition of the significance of Commerce's role in this field. In recognition of its importance, NTIA is headed by the Assistant Secretary of Commerce for Science and Technology.

Question. Has the Commerce Department's Commodity Control List been reviewed recently? If so, were there any space-related technologies which were approved for export which had formerly been prohibited from being exported?

Answer. Except for a group of approximately 38 items which the U.S. controls unilaterally (consisting of items controlled for foreign policy purposes, short supply purposes and in certain instances national security purposes), the Commerce Department's Commodity Control List is synonymous with the international export control list agreed to by COCOM, the multinational organization (consisting of the NATO nations, minus Iceland, plus Japan) whose members coordinate their controls on exports to Communist countries. The COCOM control list consists of items having both significant military applications and civilian uses and therefore controlled for purposes of maintaining Western security. It is reviewed every three to four years in multilateral negotiations at COCOM headquarters in Paris. A list review is presently in progress and a revised control list is expected to be issued early in 1980.

As part of this current review, certain relaxations in controls on space-related items are expected to occur. The details on these changes are currently being confirmed in the multilateral negotiations in Paris and the results will be announced when the changes go into effect in the next few months. It would be premature, however, for us to discuss these changes in controls until they have been finalized by all parties in COCOM.

Question. What were the results of the Defense Department/Commerce Department critical technology study? Is the review completed?

Answer. The Defense Department has not as yet completed their study. Section 5(d)(3) of the recently passed Export Administration Act of 1979, however, directs that the initial version of a list of military critical technologies shall be completed and published in an appropriate form in the Federal Register not later than October 1, 1980.

Question. Please comment upon the recommendation No. 7 of the House Science and Technology's panel on international space activities which says that present procedures inhibit the effectiveness of U.S. industry in competing for international procurements and recommends that the control process for space related exports be streamlined and simplified.

Answer. Export procedures play a relatively minor role in determining U.S. industry's competitiveness in the international telecommunications market. Of greater impact are political, financial and technical factors.

If technical factors were the only operative ones, the U.S. would have no difficulty maintaining its position of leadership in the field. There is no reason to assume that any other nation is ahead of us in the technical aspects of telecommunications and satellite systems. Diplomatic and financial factors, however, can and do change the balance at times.

Space-related programs are of great importance to several other countries and their governments mount concerted diplomatic efforts to promote sales in this area. Representatives of foreign governments up to the Ambassadorial level involve themselves in these sales promotions efforts. This can end by surrounding a projected sale with considerable diplomatic significance beyond its concrete technical features.

Furthermore, because of the significance that foreign governments often attach to this type of program, they often make available to their exporters far more favorable financial arrangements than are available to U.S. exporters. This facilitates capital investment and makes necessary loans and guarantees available on more favorable terms than U.S. exporters can.

This is not to say, of course, that export control procedures play no role or that they cannot be improved. But their impact on U.S. competitiveness in the space field is secondary to these more far-reaching diplomatic and financial factors.

Question. Technology transfer and cooperation can be economically and politically beneficial. However, there is claim by some space system developers that export control administration seems to be an adversary process—government versus industry—when in doubt deny the license rather than when in doubt grant the license. Do we fully understand the potential benefits of a positive export policy?

Answer. A "positive export policy" is difficult to define to the satisfaction of all concerned. It cannot mean the free export of all items and technologies, including those whose acquisition by potential adversaries would injure the U.S. national security. But equally, it cannot mean an excessively cautious policy that would deny so many exports on national security grounds that it would injure the U.S.' economic health. Thus, the proper definition of a "positive export policy" becomes a debate as to where to draw the line between those two extremes.

The answer to that question varies widely depending on who is being asked. In our opinion, all parties to the export administration process understand the benefits of a "positive export policy." But their interpretations of this term will vary depending on their interests and their responsibilities. The exporter will emphasize the need to sell abroad. NASA and the Defense Department will emphasize the need to protect sensitive military-related technologies. Those agencies charged with administering export controls, i.e., State and Defense, must strike a balance between these two imperatives. This is never easy to do and frequently ends by satisfying nobody entirely, but it is only what must be expected when a process is called upon to maximize two goals that are frequently mutually exclusive, in this case, export promotion and export control.

Question. How do we assure that our export control policies do not adversely affect our industries and closely-related jobs? It is my understanding that frequently there is a disposition to allow export only of what others have rather than what they do not have, locking U.S. industry into a losing market position. Can the review process be made to take a more positive approach?

Answer. Commerce has always taken into consideration the effect on U.S. industry and jobs when it is considering denying an export application, although there are times when national security and foreign policy considerations may be regarded as overriding. However, the legislation just passed to amend and extend the Export Administration Act makes explicit the requirement to take such matters into account in the export administration process. Furthermore, it is worth noting that the number of export applications that are denied is very small—less than 2 percent of all those received.

When considering a license application, we do consider a country's own capabilities in a strategically significant commodity area before we establish our own control limits. Understandably, however, our control limits are typically set lower than the Communist bloc's demonstrated capability in order not to aid them militarily to any significant degree. This may contribute somewhat to hampering U.S. export marketing in Communist countries but it is necessary in order to protect the U.S. technological lead and its national security in a highly sensitive technological area.

Question. Future space R. & D. programs as well as new space programs can become sufficiently large as to require international cooperation. What is being done to facilitate such cooperation where exchange of information may be essential?

Answer. The Office of Export Administration plays no role in this field.

Question. What restrictions are placed on U.S. industry's use of foreign launch vehicle services such as the European Space Agency's Ariane? Does a U.S. corporation require U.S. authorization? Do you believe such a requirement should be imposed?

Answer. The Office of Export Administration plays no role in this area.

Question. What role, if any, does the national security export control system play in the establishment or sale of earth resources ground stations to other countries?

a.) Recently there has been much criticism of the amount of time which is required to obtain export licenses. What is the average length of time required to obtain a license?

b.) I am told that the inability to obtain an export license in a timely manner has in a number of cases resulted in industry's losing out on important markets. How can we accomplish this process in a more timely manner?

Answer. The Comerce Department's role in the establishment or sale of earth resources ground stations is confined to the issuing of licenses for the sale of the ground portion of an earth resources satellite system. Commerce also licenses airborne earth resources platforms which are important in the preliminary evaluation stage of an earth resources program before it is decided to place a satellite in orbit. The remaining portions of such systems appear on the U.S. Munitions List and fall under the jurisdiction of the State Department's Office of Munitions Control.

The overwhelming majority of export license applications received by OEA are decided within less than 90 days. Ninety percent are decided in 30 days or less. Ninety-seven percent are decided in 90 days or less. Only 3.3 percent require more than 90 days to process.

It is worth noting that long processing times for license applications in the telecommunications area occur primarily in connection with proposed exports to Communist nations. Telecommunications equipment and satellite-related systems have significant potential military applications in the areas of surveillance and reconnaissance. Because of these sensitive military concerns, it can sometimes take considerable time to evaluate such export applications.

In keeping with the mandate of the new legislation recently passed to amend and extend the Export Administration Act, OEA is instituting improvements to the case review process to speed case flow. A new management team was installed in OEA in June 1979 with a comprehensive mandate to overhaul case processing procedures wherever necessary to accelerate the response to exporters. OEA has instituted "front-door licensing" whereby routine cases are identified and processed to completion immediately upon receipt. The new management team is engaged in discussions with other major reviewing agencies as to how best to shorten the time it takes for these agencies to review and make recommendations on cases referred to them for comment. It is commencing to design a systematic capability in OEA for assessing foreign availability of items proposed for export and is studying the case processing system in detail to identify other steps than can be taken to speed case flow.

Question. History has shown that the United States can apply the results of research and technology at a faster rate and more effectively than anybody else in the world. This capability puts our industry in an advantageous position. What can we do to assure that our export control policies do not inhibit this advantageous position?

Answer. In addition to the measures that Commerce is instituting on its own initiative, the legislation recently passed to amend and extend the Export Administration Act addresses this concern in some detail. This legislation was the outgrowth of long debates and detailed hearings held by both Houses of Congress which drew extensively upon the insights, expertise and experience of industry and government alike and which focused heavily on this subject throughout.

Question. What studies, if any, are under way in the Executive Branch for streamlining and simplifying export control procedures? When do you expect such procedures will be implemented?

Answer. No such studies are under way at present in the Executive Branch. A comprehensive interagency study of U.S. export control policy was completed in mid-1978. The legislation recently passed to amend and extend the Export Administration Act mandates numerous measures to speed the export control process, and the Office of Export Administration has already implemented some and is studying others.

Question. Do the roles of the respective agencies which participate in export control need to be clarified?

Answer. The roles of the agencies participating in the export control process are well established and are well understood by all participants from long practice. However, the legislation recently passed to amend and extend the Export Administration Act further clarifies and makes specific certain aspects of the Defense Department's role in this process.

[Whereupon, at 3:40 p.m., the subcommittee was adjourned sine die.]

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